

# MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 9

JANUARY, 1937

Number 8

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**A**  
**Magazine**  
**for**  
**Mechanical**  
**Executives:**  
**Construction**  
**Production**  
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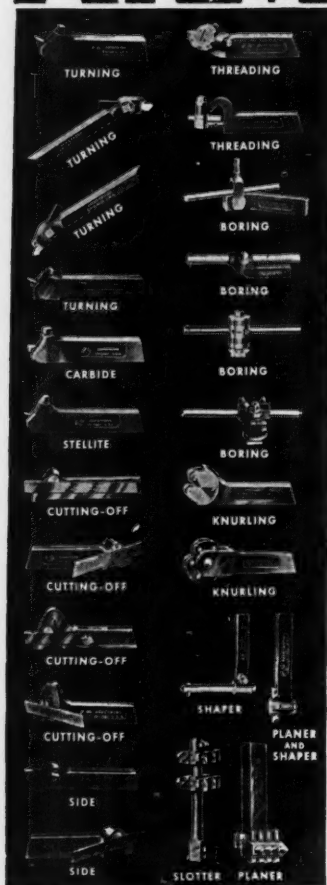
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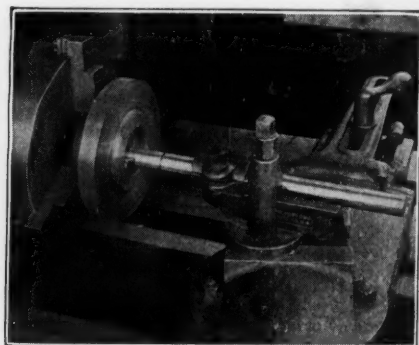


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# MODERN Machine Shop

CINCINNATI, OHIO

JANUARY, 1937

VOL. 9, No. 8

## Building the General Electric Refrigerator

BY RAY E. KIDD

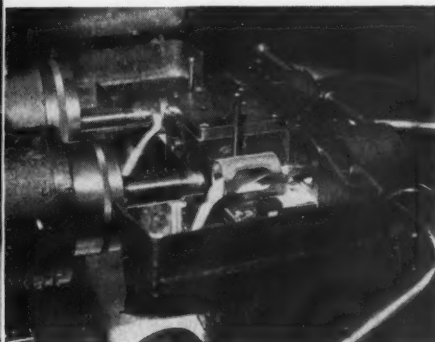
THE advantages and convenience offered by the modern mechanical refrigerating unit have given it a place of considerable importance in our facilities for living, consequently in view of the research and manufacturing equipment available within the General Electric Company's organization, it was to be expected that this company would produce a refrigerating unit that would in every way uphold the General Electric tradition.

The General Electric refrigerator's reputation for quality products is well known. In view of this fact, the author is pleased to present here a few of the more interesting manufacturing and inspection operations involved in the production of this unit.

There is no mechanical unit made on a production basis which is so dependent for its success upon accuracy and close fits as the domestic mechanical refrigerator. The precision re-



Fig. 1—Precision boring crank hole in compressor slide. Below is a close view of the operation.



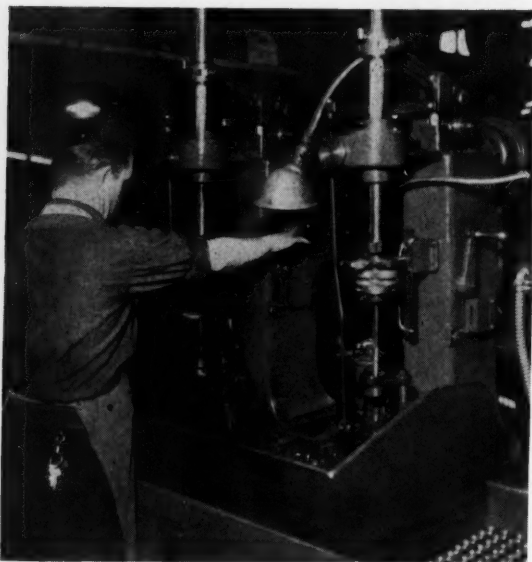


Fig. 2—The crankpin bore in the compressor slide is honed to size in this two-spindle Hutto honing machine.

quired on some parts is such that metal-to-metal fits must be made which will be so close that gas cannot escape between the contacting members. Such accuracy is expensive and were it not for the superior quality of modern machine tools, the cost of the mechanical refrigerator would be prohibitive to the average household. Parts must be manufactured not only within limits of extremely fine accuracy, but at a speed which will bring the manufacturing cost down to a point that will make it possible to market this product at a popular price.

One of the machines in which close accuracy is combined with high speed is the Ex-Cell-O two-

into the bore and which is withdrawn as soon as the parts have been chucked on the outside diameter. The slides are of "electric" cast iron. The tools revolve at a spindle speed of 1800 r.p.m. and the work has a cutting speed of 350 ft. per minute and 0.003 in. feed per revolution. These parts are bored to within 0.00025 in. of the specified drawing size.



Fig. 3—Gaging fits on crankshafts, using a General Electric multiple electric micrometer gage with which 100 shafts per hour can be gaged.

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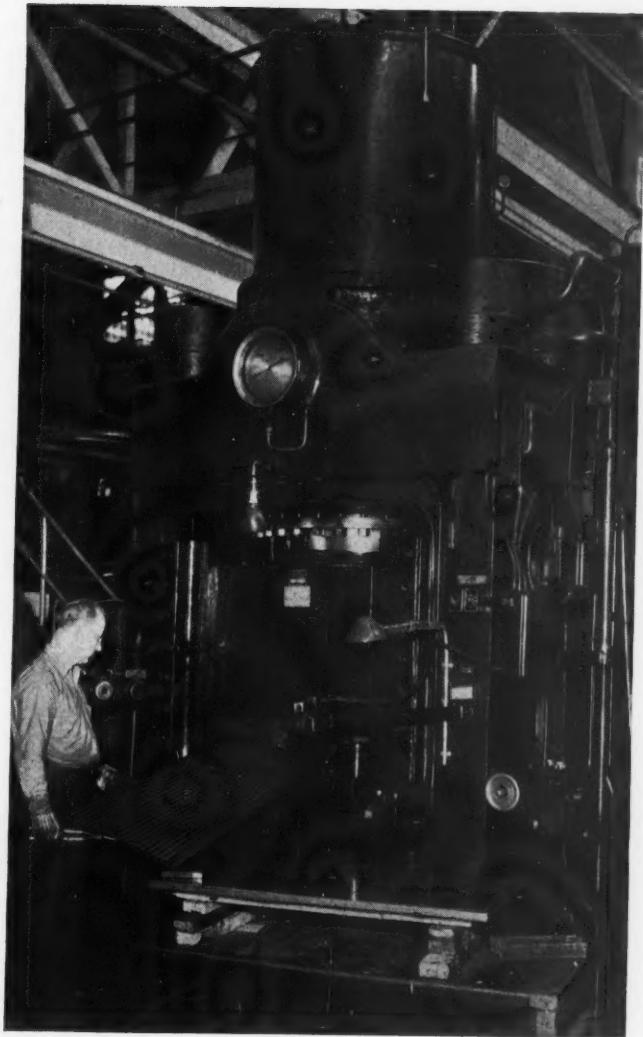
Fig. 4—Forming corrugations in refrigerator condenser sheets, for which a 1500-ton H.P.M. Hydraulic Press is used.

The crankpin bore in the refrigerator slide is honed to give it the necessary finish and accuracy in the hole, the honing operation being performed on the Hutto two-spindle honing machine shown in Fig. 2. In this case, as in the previous operation, the part is located by means of a disappearing locating pin which fits into the bore, and is clamped on the outside diameter. The hones are adjustable by thousandths of an inch to compensate for wear on the stones.

Operating at a speed of 350 r.p.m. and 135 strokes per minute, the hone is set to remove 0.0005 in. of stock in 13 strokes, the length of the stroke being  $\frac{1}{2}$  in. The machine is equipped with an electric timer which stops the mechanism immediately upon the completion of the 13 strokes, so that no time need be lost by the operator in keeping track of the number of strokes. The hole

is held to a limit of 0.0003 in. on the diameter, 0.0002 in. for out of round, and 0.0002 in. taper. The average output on this operation is 130 pieces per hour.

Figure 3 shows the use of a special G. E. four-instrument electric microm-



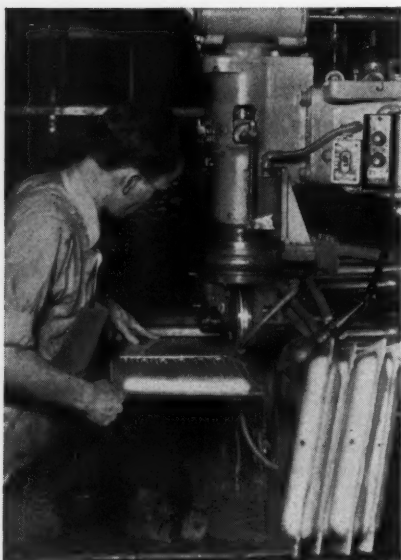
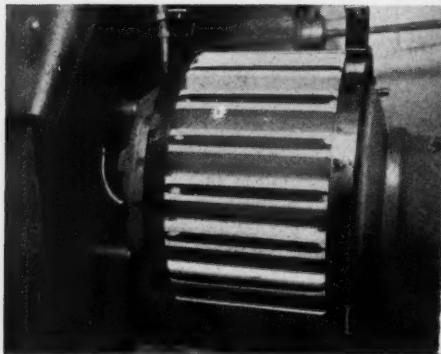


Fig. 5—Line-welding the evaporator, which is done at a speed of 72 in. per minute. The weld must be vacuum-tight.

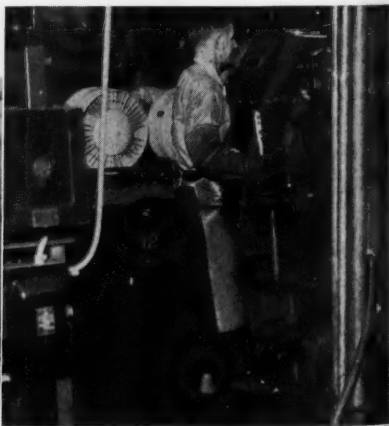
eter gage for testing the various fits on the crank shafts. The shaft is located in V-blocks which are faced with Carboloy to withstand wear, and the instruments will immediately show

Fig. 6—Arc welding compressor case to base, using automatic welding machine. Close view of operation below.



the amount of variation from drawing limits. The shaft is held to limits of 0.0002 and 0.0003 in. on the diameters of the crank pins and squareness of end thrust, and the shafts are gaged with this instrument at a rate of 100 pieces per hour.

Refrigerator condenser sheets, which are made from hot rolled steel, are corrugated in the 1500-ton H.P.M. hydraulic press shown in Fig 4. The flat, smooth steel sheet is located in the press between locating pins, and corrugations are formed by special forming dies made of Kinite steel, the depth of the draw being  $\frac{1}{4}$  in. Inasmuch as the press is operated by hydraulic power, the action is smooth and even, with complete absence of shock; thus the pieces are perfectly formed without undue wear or strain on the dies. These sheets are corrugated at a speed of six pieces a minute, they must be drawn as required without fracture, and there must be no distortion of the sheets as they are line welded in a later operation. A similar die is used in the production of the condenser, a double deck die being used in which two pieces are processed at one operation of the hydraulic press.



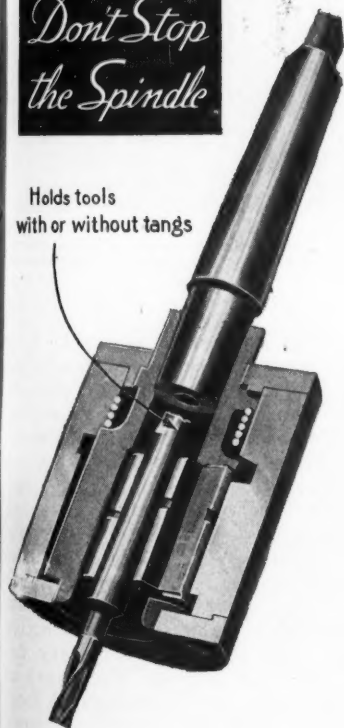
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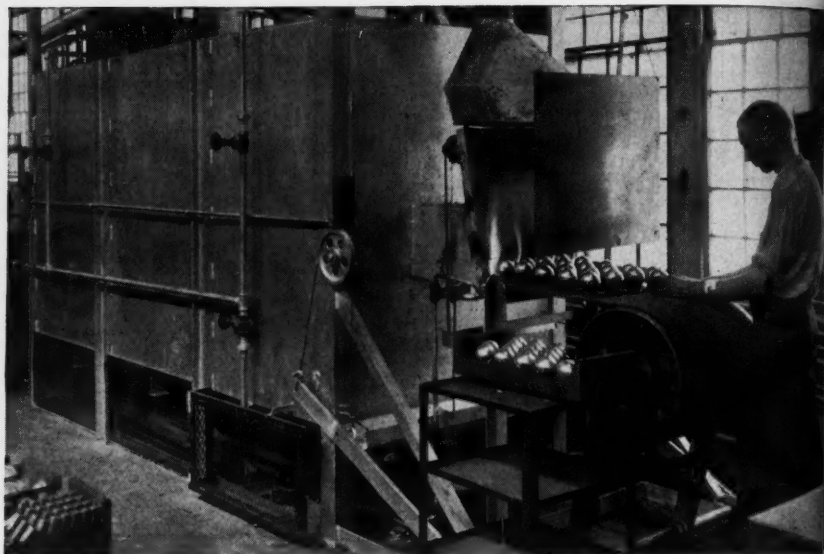


Fig. 7—G. E. 88 kw. mesh belt conveyor-type electric furnace being used to braze floats. Production, 800 pieces per hour. This furnace is also used for bright annealing at temperatures of from 100 to 1120 deg. C.

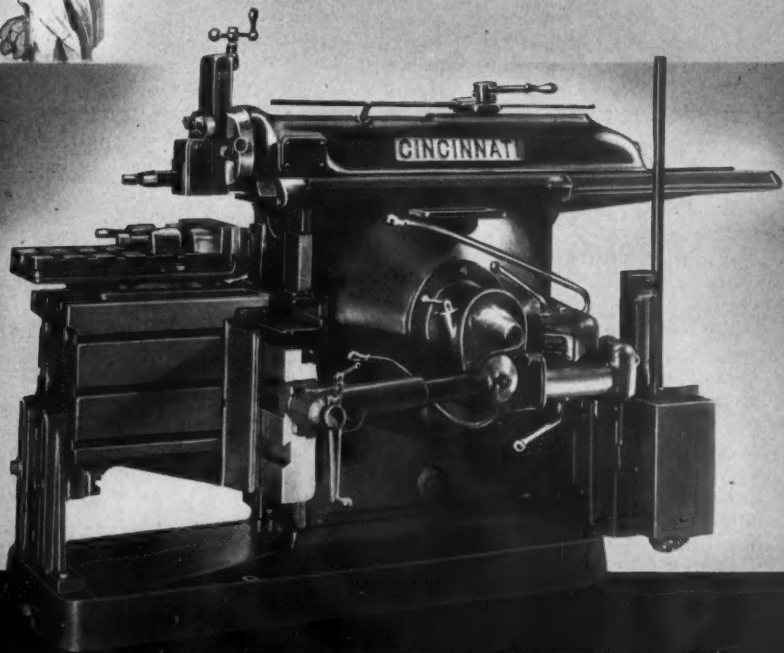
The operation of line-welding the evaporator, which is of "18-8" stainless steel, 0.025 in. thick, is illustrated in Fig. 5. The machine in which this operation is performed is a Thomson-Gibb line welder, rated at 60 kva, 550 volts, 60 cycles, and utilizing an Elk-alloy Wheel Electrode. A friction feed wheel is so located that the work is passed between the friction wheel and the electrode from left to right, the welding operation being continuous as the work is fed through between the wheels at a speed of 72 in. per minute. The weld must be vacuum tight and able to withstand a very high pressure. The time and heat of the welding cycle are governed by a Thyatron control and the part being welded is cooled continuously by a flow of water.

The operator shown in Fig. 6 is operating a machine which automatically arc welds the compressor case

to the base. The work is held in a special fixture consisting primarily of a head and air operated tailstock. As the work is revolved, it is welded by a stationary electrode, using welding wire which is automatically fed to it from reels mounted under the machine. The weld is made at a speed of approximately 10 in. per minute and it must be vacuum tight. As the illustration shows, the operator watches the operation through a welding lens which is set into a protective shield; thus it is not necessary for him to wear a helmet. The speed of this operation can be estimated from the fact that the machine shown welds approximately 1150 linear feet of metal per week.

In the illustration Fig. 7 is shown the brazing equipment with which such parts as pistons, floats, float chambers, exhaust and intake mufflers, and similar parts are brazed.

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Fig. 8—Testing a refrigerating unit for gas leaks.

The equipment is a G. E. 88 kw. mesh belt conveyor-type electric furnace. In the brazing operation the work passes through a heating chamber which is 20 in. wide by 10 in. high and 8 ft. long, then through a 24-ft. cooling chamber. Atmospheric control is the outstanding feature of this furnace, and the furnace can be used for bright annealing at temperatures from 100 to 1120 deg. C. The parts shown in process in the illustration are floats, which are brazed at a rate of 800 pieces per hour. Pistons are processed at a rate of 300 pieces per hour in this furnace.

Each refrigerating unit, upon completion, is tested for gas leaks. To make this test, the unit is hung on a conveyor and passed through a chamber in which the atmosphere contains a certain amount of ammonia gas. If there is a leak in

the unit, the sulphur dioxide in the unit, upon coming in contact with the ammonia, forms ammonium sulphite which appears as a white vapor at the point where the unit is leaking. In the illustration Fig. 8, it is necessary to use enough light so that the unit could be seen in its position in the booth. However, in actual operation the interior of the booth is kept dark except for the spotlight which is held in the hand of the operator. This spotlight, as shown, is suspended by a cable so that the operator's arm is relieved of the weight. As the unit passes the window of the booth, the light from the spotlight is thrown upon the unit and if there is the faintest trace of ammonium sulphite, it will show up in the light in the same way that dust particles floating in the air will shine in a beam of sunlight coming through a window. All refrigerating units are subjected to this test.

In Fig. 9 an inspector is shown using a special G. E. enamel thickness gage to gage the thickness of the paint on the unit. With this instru-



Fig. 9—Gaging the thickness of the paint on a finished unit. With this G. E. electric thickness gage, any non-magnetic finish can be gaged to within 0.0005 in.

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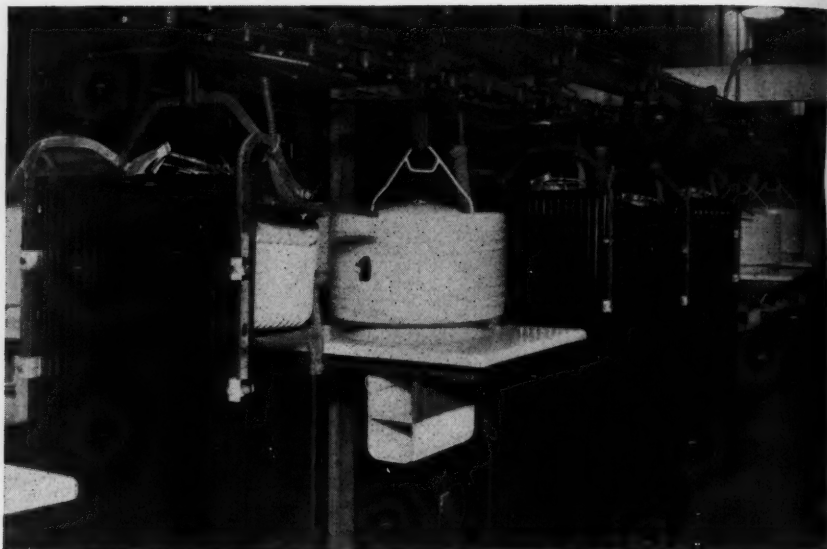


Fig. 10—Each finished unit is given a "running" test while it is being conveyed from the unit assembly to the final assembly.

ment the thickness of paint, enamel, celluloid, glass, mica or other non-magnetic materials which have been applied to flat sheets or plates of steel or iron can be measured to within 0.0005 in. The contact is made with the "gage head" which can be seen in the inspector's right hand and which, in operation, is held in contact with the surface of the material to be gaged. In actual operation the gage head is moved about to several different points in order to obtain an accurate reading. Inasmuch as it is only necessary to contact the flat surface of the gage head with the flat surface of the work-piece, no mark of any kind is made on the surface under inspection. By the use of this instrument the inspector is enabled to determine the exact thickness of the coat of paint or enamel that is applied to the unit.

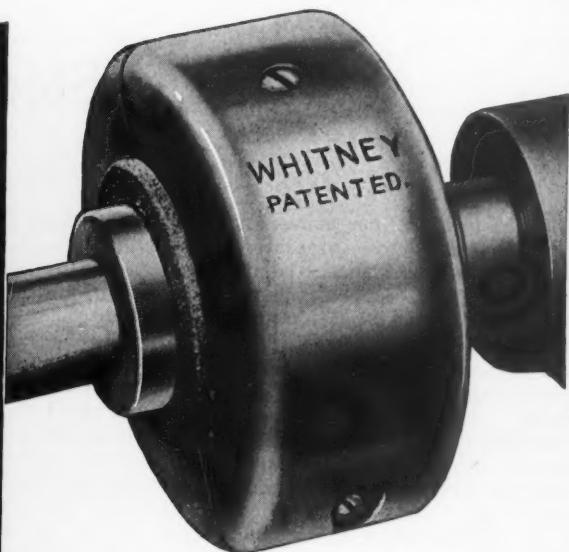
Each unit is given the usual "running" test before it is finally approved

and assembled to the cabinet for shipment. In order to save time and handling, however, this test takes place while the units are on their way from the unit assembly to the final assembly, each unit, together with the refrigerator top to which it is assembled and the evaporator underneath, being hung from a moving conveyor as shown. The room through which the units pass while undergoing this test is air conditioned to a temperature of 75 deg. F., so as to reproduce as nearly as possible the room temperature of the homes in which they will ultimately be used.

Upon their arrival at the final assembly, if the units pass the usual operating, noise, and finish tests, the assembly is completed and the units are assembled to the cabinets.

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# Stainless Steels

BY GEORGE M. ENOS

Asst. Professor of Metallurgy, University of Cincinnati

THE technical magazines and trade journals have presented many articles dealing with the composition, properties, and uses of the group of ferrous alloys collectively known as Stainless Steels. Even the fiction magazines carry advertizing and articles dealing with this subject until today "stainless steel" is as much a household word as aluminum. No one article can hope to discuss the subject completely, for the information now available would fill a large volume. Nevertheless, it is believed that an abstract of certain fundamentals of the subject may be of interest.

Strictly speaking, the term "stainless steels" is a misnomer, for many of the alloys included within this group are readily stained under special conditions. Even the term "steel" can only be used in a general sense, for many of the useful alloys contain so little carbon that the preferred term for them would be "stainless iron". To define the group of alloys under consideration is not easy, but the following definition may be sufficient.

"Stainless steel" is a general term covering iron base alloys to which a substantial addition of chromium has been made, with or without other alloying elements. These alloys exhibit marked resistance to attack by a wide variety of corrosive agents.

So many people have experimented with these alloys, and so many patents have been issued, that no attempt will be made to list either. Something over 20 years ago stainless steel of the cutlery type, developed in England by Brearly, was put on the market.

Now there are many alloys and many uses, ranging from kitchen utensils to railway trains and from valve stems to architectural trim.

## Composition of Stainless Steels

Table I lists examples of the names, nominal compositions, and properties of stainless steels. It should be noted that only a few of the steels available are here listed, and that the compositions stated are merely examples and not exact specifications. The S. A. E. specifications include two designations of the type given for number 6, viz 30905, with a max. carbon of 0.08 per cent, and 30915, with carbon variation from 0.09 to 0.20 per cent. For each the chromium may vary from 17 to 20 per cent, and the nickel from 8 to 10 per cent.

For the straight chromium steels the S. A. E. specifications fix a max. of 0.12 per cent C on four out of 5 listed, and variation from 11.50 per cent or upward. For example, 51210 specifies 0.12 per cent C max., 0.60 per cent Mn max., 0.75 per cent Si max., 0.030 per cent S max., 0.03 per cent P max., and a chromium range of 11.5 to 13.00 per cent. Many modifications of analysis are possible, and small, but effective, amounts of various elements are sometimes added for special purposes.

Referring again to the table, the first three steels listed can be hardened by heat treatment, whereas the others cannot be so hardened. The most popular composition for general use is often referred to as the "18 and 8" type, of which No. 6 is an example. Many manufacturers have given trade

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names to their products, so that the names of Enduro, Nirosta, Rezistal, Silchrome, Allegheny metal, and others are quite familiar to the public. For a comprehensive list of trade names and producers, reference may be made to "The Book of Stainless Steels", or to the Metals Handbook, both pub-

refining steel in any furnace, carbon is removed to whatever value is desired by a process of oxidation. Nickel is not oxidized readily in melting practice, so it can be present throughout the refining process if need be. Chromium, however, is readily oxidized.

When it is essential that the carbon

# TABLE I

Types, Uses, and Nominal Compositions of Stainless Steels, A Selected List.

TYPE	NOMINAL COMPOSITION, IN %					USES
	C	Si	Mn	Cr		
1. Cutlery .....	0.79	0.40	0.45	16.50	.....	Knives, Surgical Instruments
2. Ball Bearing .....	1.05	0.45	0.40	17.00	.....	Where maximum abrasion resistance is required
3. Valve .....	.50	2.75	.50	8.75	0.15	Valves for internal combustion engines
4. Stainless Iron .....	0.10	.50	.50	18.00	.....	Interior decoration
5. ....	max. 0.25	1.25	0.75	8.50	Ni 22.00 Cu—1.25	Resists salt water and sulphuric acid
6. 18 and 8 .....	max. 0.20	0.50	0.40	18.00	Ni 8.00	General purpose corrosion resistant material
7. 25 and 12 .....	max. 0.20	0.50	0.60	25.00	Ni 12.00	Retains strength and resistance at high temperature

lished by the American Society for Metals. Practically all of the alloys which can be included in any list of "stainless steels" are patented, but space will not permit discussion of this topic.

## Manufacture of Stainless Steel

Practically all of the higher chromium low carbon stainless steels are made in electric arc furnaces of the Heroult type lined with a basic hearth. Small amounts are produced in induction furnaces, and experimental heats have been made in open hearth furnaces.

In making stainless steels of higher carbon content, the problems are not so difficult as in making lower carbon heats. Without going into the details of making steel, a few important points may be mentioned. First, in

be kept to a low value, say less than 0.10 per cent, the carbon must be removed before any chromium is added, or else large amounts of the expensive chromium will be lost to the slag. Since chromium is added as ferro chromium, this means that the ferro chromium must also have a low carbon content. The furnace electrodes must not be allowed to dip into the molten metal as carbon may thus be added to the steel. Carbide slags, often used in basic electric practice in making tool steels, must also be avoided.

Second, high temperatures in melting and during the period when the ferrochrome is dissolving are essential, for chrome steels have high melting points and become sluggish at lower temperatures. Third, there is

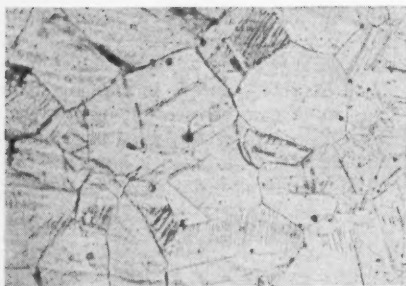


Fig. 1—Photomicrograph of "18 and 8" type Stainless Steel. Material has been cold worked, annealed, and slightly stained. Normal "twinned" structure. Etched. Original magnification X500. Reduced 2/3.

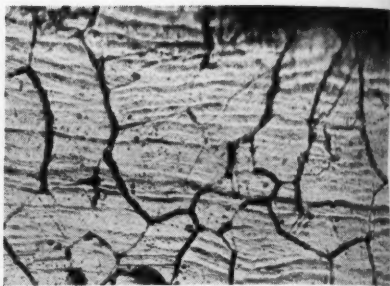


Fig. 2—Photomicrograph of corroded edge of same type steel as Fig. 1. The thick grain boundaries are evidence of the intergranular corrosion attack. Etched. Original magnification X500. Reduced 2/3.

little hope of producing low carbon stainless steel in conventional-type open hearth furnaces, because of the excessive losses of chromium to the slag, for conditions in a basic open hearth are distinctly oxidizing. It may be possible to produce these steels economically in basic open hearth furnaces of special design.

Once the ingots have been produced, they may be formed into the usual mill products, but the process usually requires more care than is needed in handling plain carbon steels, or low alloy steels. Details of practice cannot be considered here. Some of the higher chromium alloys and more complex alloys must be forged rather than to be put through the blooming mill in the first stages of reduction. After slabs or billets are formed, their surfaces must be prepared by chipping or grinding to remove all surface defects. Other operations incident to steel mill practice, such as reheating, pickling, annealing, cold rolling, and the like, usually require special care.

From the brief survey of manufacturing difficulties just made, it is not surprising that costs are high. The actual cost of the raw materials in a pound of "18 and 8" is about 8 cents. The value is increased to about 14 cents by the time the steel is in ingot

form. By the time it reaches the market the price is above 20 cents a lb. Tour and Lippert (Iron Age, Sept. 17, 1936) point out that with carbon steel selling at about 2 cents a pound, and non-ferrous alloys, which may be quite suitable for use where stainless steel might be used, selling around 20 cents a lb., there must be definite superiority of the stainless steel if a market is to be maintained. That such superiority does exist is evidenced by the rise in production during the last ten years, culminating in a production of 135,000,000 lbs. in 1935.

#### Heat Treatment of Stainless Steel

In the heat treatment of any alloy as complex as stainless steel, users should be guided by the specific recommendations of the manufacturer. There are, however, some general considerations that may be briefly reviewed.

Those steels which contain high carbon and not too high a percentage of chromium can be hardened and tempered. For example, the steel numbered 1 in Table I can be forged from 2000 to 1700 deg. F., softened at 1400 to 1450 deg. F., annealed at 1625-1675 deg. F., preheated for hardening at 1450-1500 deg. F., hardened by quenching from 1825-1925 deg. F., and tempered in range 300-800 deg. F. When



### Basically Different

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oil quenched and tempered at 450 deg. F. it will have a yield point of about 245,000 lb. per sq. in., with a Brinell hardness of about 545, whereas when annealed, these values will drop to 54,000 lb. per sq. in. and 185 Brinell.

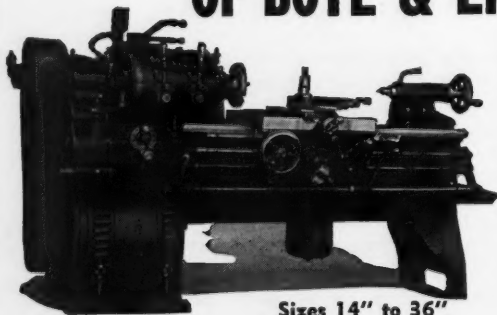
Stainless irons and alloys of the "18 and 8" type, and some others, are often called (though in some cases erroneously) "austenitic" steels. Alloys of this type cannot be hardened by quenching, although they may be quenched for other reasons. They can be hardened by cold work, and can be softened after cold work by annealing. For example, the usual "18 and 8" steel may be forged at 2350 deg. F. to 1750 deg. F., completely softened by cooling rapidly from 2000 to 2200 deg. F., and partially softened at 1600-1700 deg. F. In the softest condition the Brinell number will be about 140, and the yield point will be from 30,000 to 35,000 lb. per sq. in. The rapid cooling is required to prevent some

undesirable changes which would occur in structure, if the steel were allowed to cool slowly. The steel can be worked to a maximum hardness of about 400 Brinell.

#### A Peculiarity of Steels of the 18 and 8 Type

When austenitic stainless steel containing 18 per cent Chromium and 8 per cent Nickel (or higher percentages of each of these elements) is held for some time at a moderately elevated temperature—say in the range 900 to 1100 deg. F.—it is apt to lose its corrosion resistance to a marked extent. The corrosion resistance is restored by heating above 1650 deg. F., (preferably above 1900 deg. F.) and quenching. A reasonable, simple hypothesis explains this phenomenon as follows: If any appreciable amount of carbon is present, complex carbides of iron and chromium are present and may be precipitated from the austenite

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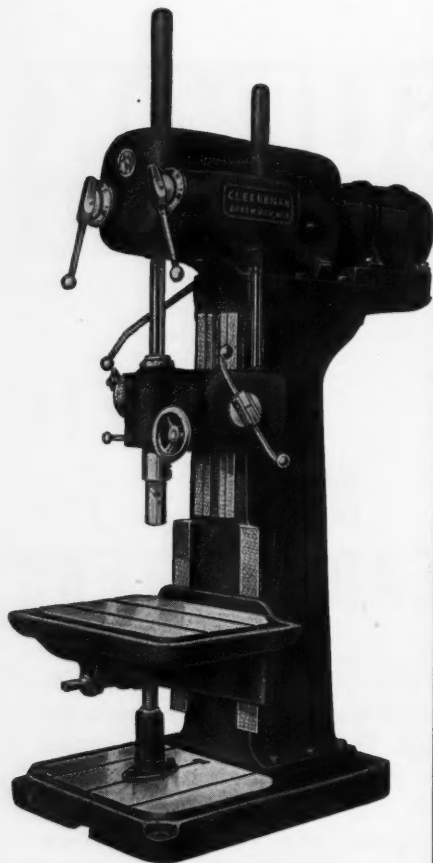
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(solid solution) in the "sensitive" range of temperature. As the carbides came out of solution they appear at the grain boundaries, thus depleting the center of the grains of chromium. Chromium is the agent "protecting" the steel against corrosion.

The remedies used to prevent the precipitation of carbides are: (1) Cool rapidly through the dangerous range. (2) Do not use the steel in this range of temperature. (3) If it is desired to use the steel in the dangerous temperature range, secure a steel that has been "stabilized" against the effect by additions of titanium or columbium, for these elements have been found effective in this respect. (4) Use a steel of very low carbon content, so that no appreciable amounts of carbide can form.

Figure 1 shows a photomicrograph of a typical stainless steel of the 18 and 8 type that has been cold worked, annealed, and properly quenched. Figure 2 shows the carbide precipitation at the grain boundaries in a steel that had been severely corroded in service due to the phenomenon which has been discussed. This type of failure is often called "intergranular corrosion."

### Corrosion Resistance of Stainless Steels

Even a few per cent of chromium added to steel will cause marked increase in corrosion resistance. Low carbon steel with about 5 per cent chromium has marked corrosion resistance for some purposes, and is often modified to improve mechanical properties by addition of other elements. In general, very marked improvement is secured by adding 10 to 12 per cent chromium. As previously indicated, there are many variations of composition possible—some 60 different compositions being on the market—so that a choice becomes a matter of determining, first, the particular composition best suited to meet

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the corrosive conditions in view, and, second, if several compositions are suitable, then choosing on a basis of physical properties and price.

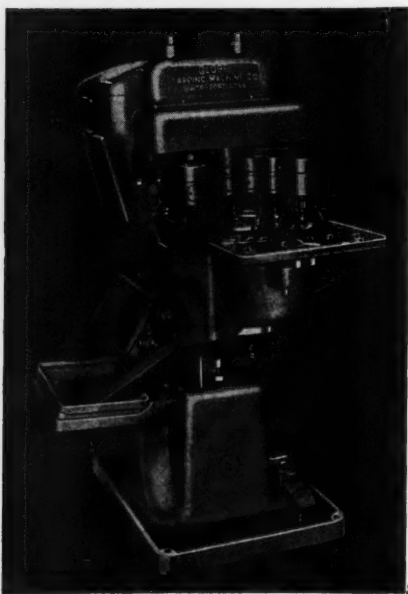
Since the corroding medium may be any of many, it is difficult to generalize. Among the many corroding media a few may be mentioned, such as moist air, sea water, furnace atmospheres, various chemicals, and fruit juices. Every application of a metal part where corrosion may be encountered becomes a separate special problem. From the list of "stainless steels", it is possible to select a steel that will withstand corrosive attack from a wide variety of agents. While nickel, and perhaps some other elements may contribute to a slight degree to the corrosion resistance, chromium is the dominant element in influencing corrosion resistance.

The rusting of ordinary iron or steel produces a corrosion product in the form of a film, or coating, which

does not, in general, protect the underlying metal from further attack. When sufficient chromium is present in the steel a different kind of a corrosion product is formed; a coating which is impervious to further attack. This coating will not resist all corrosive agents, but the fact that it resists so many makes the steel valuable in industry.

It should be noted that the coating is not detectable by ordinary means, but, as a transparent, very thin film, it is very effective unless disturbed mechanically or chemically. Where the service the metal is to meet requires that no staining or discoloration take place, it is important that the material be properly finished and polished, and that the polish be not disturbed by mechanical means.

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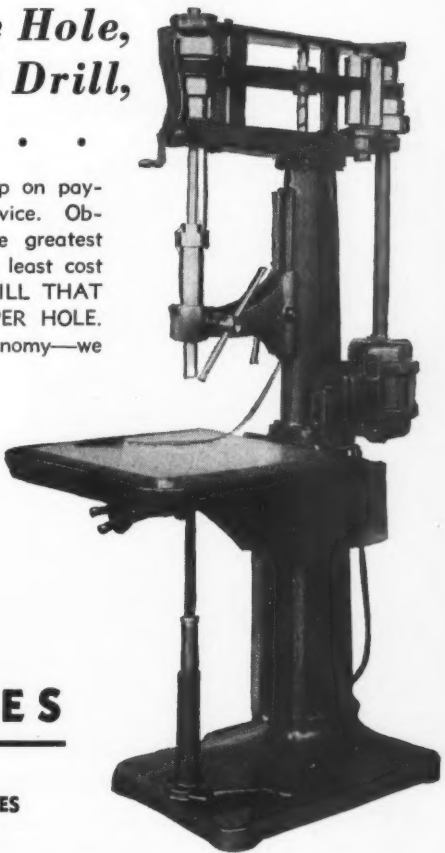
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# Grinding Direct From the Drawing

BY RENE W. P. LEONHARDT  
Berlin, Germany

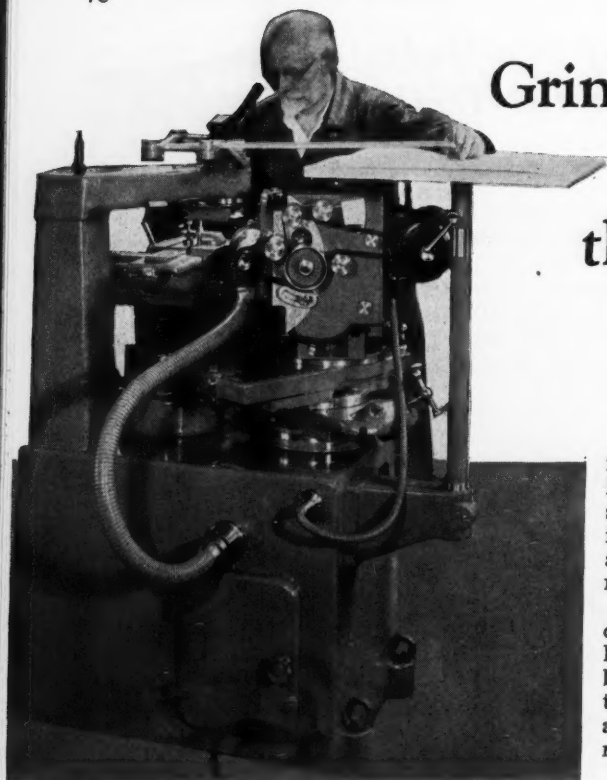


Fig. 1—Profile Grinder of Unique Design

THE making of form tools, gages, and so on has in the past been subject to high costs and more or less difficulty, especially when the profiles included irregular lines and curves. In many cases the production of such parts necessitated the making of other hand-made gages for checking purposes, which added to the cost of the original job. Where a high degree of accuracy was required, costs of production were high. Recent years have seen the development of machines for finishing profiles to size, or nearly to size, thus making it possible to produce such work at much lower costs than formerly. Among these machines is one that has been designed by the

firm of Loewe Gesfurel, of Berlin, and which involves some ideas that might be of interest to machine designers and other readers of this magazine.

With the machine under discussion not only can the highest degree of accuracy be attained, but production time can also be reduced to a fraction of the time formerly required.

This result has been achieved through the application of a new principle; namely, that of transferring directly to the workpiece the form indicated on the drawing. The transfer is made by means of the pantograph from a drawing which has been enlarged from the original by 50 times.

Contrary to the usual design of the engraving machine, in which the tool is arranged on a short lever arm, a microscope is placed in the short lever arm of the pantograph and the long lever arm carries the tracing needle. The grinding wheel and the motor that drives it are mounted on a special slide, entirely independent of the pantograph.

A view of the machine in operation is shown in Fig. 1. On the table at

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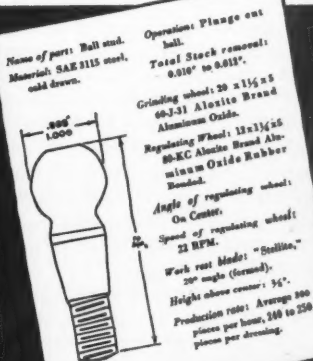
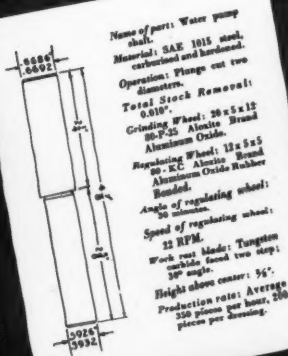
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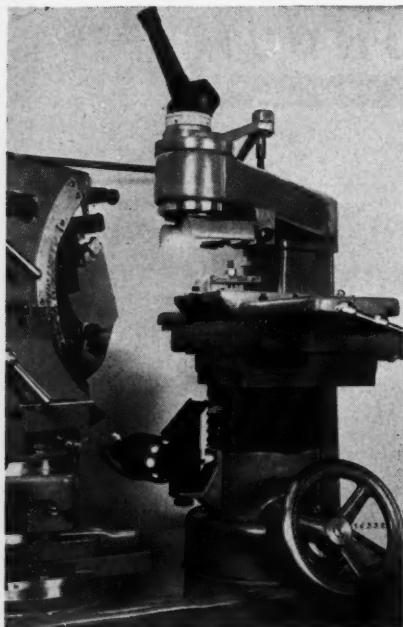


Fig. 2—Photograph of work-head, showing microscope and upper and lower illumination.

the right side of the machine (at the left of the operator) is a table upon which is fastened a drawing of the profile to be ground, enlarged 50 times. At a given point on the drawing is indicated the starting point, and this point is exactly parallel with the starting point on the workpiece. Thus when the operator is ready to proceed with the job, he sets the needle, which is attached to the long arm, at the starting point indicated and this movement brings the microscope into position over the point at which the grinding operation is to begin.

The table upon which the workpiece is clamped is shown at the right in Fig. 2. Directly over the workpiece is located a microscope which magnifies by 30. In the bend of the microscope is a mirror arrangement which reflects the image in the same posi-

tion in which it is located on the drawing. The workpiece can be illuminated by electric lights from both top and bottom, arranged for single or joint operation. The upper light is clear, while the lower light is green. In such light the image stands out clear and distinct.

The area of work visible through the microscope will measure about  $15/64$  in. and this can be increased to  $25/64$  x  $25/64$  in. by feeding the wheel. Thus a section up to the limit of the latter dimension (for which an area of  $19\ 11/16$  x  $19\ 11/16$  in. must be traversed on the drawing) can be processed by the grinding wheel before it becomes necessary to feed the work table. The total capacity without moving the workpiece on the table is  $11\ 13/16$  in. To grind to exact dimensions, both longitudinally and transversely, gage blocks are used in the same manner as they are used for this purpose in the modern type of jig-boring machine. The blocks, together with end gages which act on the plungers of dial indicators, provide for extreme accuracy. The gage block apertures are visible in Fig. 3.

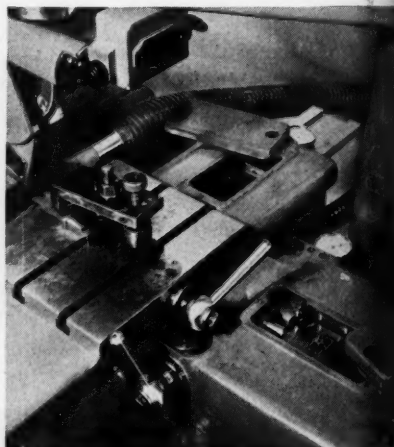


Fig. 3—Work head with end measuring gages and dial indicators.

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A view of the wheel head with the driving motor is shown in Fig. 4. As

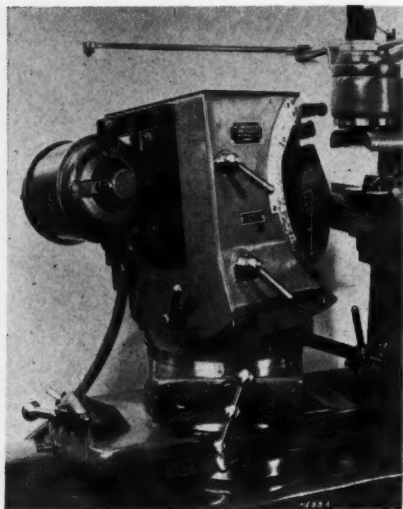


Fig. 4—View of wheel head in oblique position.

can easily be determined by an inspection of the photograph, the head can be adjusted to bring the wheel into position desired, in any plane, and feeds are provided for feeding the wheel to the work in any position or at any angle required. The wheel can be fed to grind a curve if desired. The readings of the scales are obtained with verniers within limits of accuracy of 0.1 degree.

The grinding wheel spindle is mounted in a carrier which reciprocates vertically when the machine is in operation, so that it will grind a straight path for the full thickness of the workpiece. The number of strokes can be regulated in accordance with the thickness of the workpiece; for work up to  $25/32$  in. thick the wheel operates at a speed of 80 strokes per minute and for work from  $25/32$  to  $1\ 57/64$  in. thick the wheel operates at 40 strokes per minute. The total

length of the stroke is  $1\ 31/32$  in.; thus the machine can be set so that at each stroke the wheel will clear the work by from 0.039 to 0.078 in.

With the work clamped firmly in position and the grinding ready to operate, the needle of the pantograph is set firmly down at the starting point of the profile line on the enlarged drawing. Then the wheel is fed into the work until it has cut back to a point which brings the ground edge of the work directly in line with the crossed hairs in the microscope. At this point the location of the ground edge will correspond with the finish line of the work on the drawing, under the needle. The wheel is backed out and the operation is repeated until the profile line has been completely covered by the needle and the work has been finished to a corresponding design.

By following this method, a double

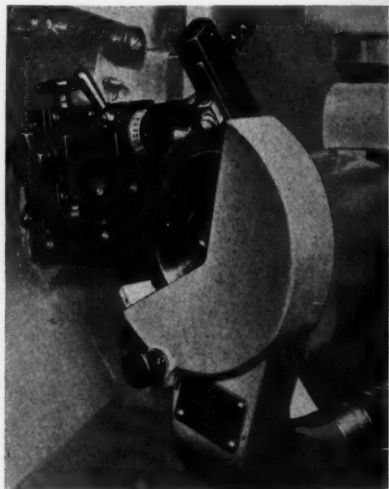


Fig. 5—View of wheel spindle with wheel slide, circular guides for angular adjustment, and wheel truing device.

check is obtained on the action of the wheel. The location of the needle on



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the finish line of the drawing should correspond with the location of the finished edge of the work under the microscope, but by watching the action of the wheel under the microscope, any wear of the grinding wheel can be compensated and perfect accuracy obtained regardless of whether or not the wheel is wearing.

The wheel slides are governed by a very fine feed, due to the fact that the pitch of the feed screws is only 0.0393

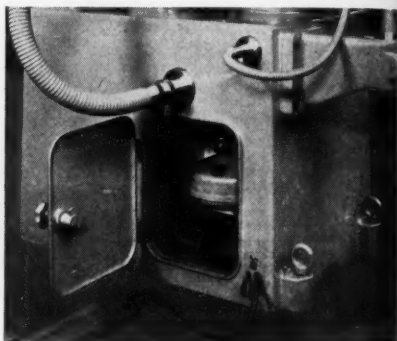


Fig. 6—Rear of profile grinding machine, showing dust-removing apparatus.

in. and also because the cranks are geared to the screws at a ratio of 1:2. Thus a feed of much less than 0.00039 in. can be obtained by hand without difficulty. Furthermore, the crank for the lower slide can be used at three different places, and it is always within convenient reach. Under these conditions it is evident that extremely close limits can be held.

The grinding wheel can be trued cylindrically, or at any angle desired, by the use of the special truing device shown in Fig. 5. In order to protect the machine and the work while truing the wheel a protecting hood is mounted over the wheel as shown. The hood is, of course, connected to the blower, which is mounted in the base of the machine as shown in Fig. 6. The blower connection is also shown

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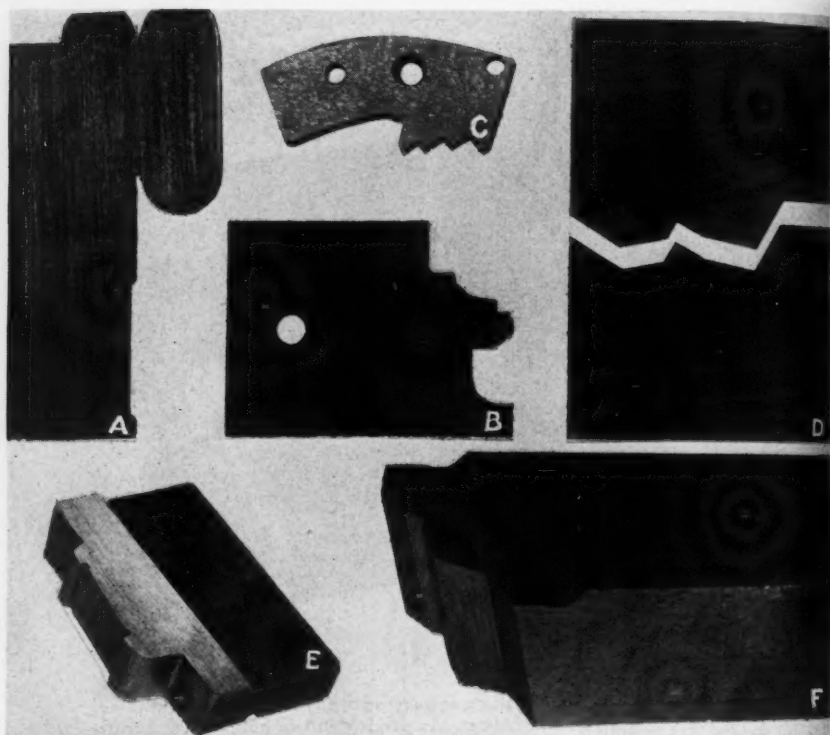


Fig. 7—(A) Inspection gage for ball bearing rings. Grinding time,  $6\frac{1}{2}$  hrs. (B) Gage for typewriter part. Grinding time,  $4\frac{1}{2}$  hrs. (C) Part for calculating machine. Time, 3 hrs. (D) Gage with corresponding gage for a relieved part with constant profile. Time,  $5\frac{1}{2}$  hrs. (E) Relieved scraping tool with constant profile for making profile tools for internal rings of conical roller bearings. Time, 6 hrs. (F) Half-size reproduction of relieved turning tool with constant profile. Time, 4 hrs.

in Fig. 3 in position to carry off the dust of the grinding operation. The work slide, Fig. 2, is also protected by a leather guard of bellows design and the ways of the machine are protected by covers.

When a profile section larger than  $25/64 \times 25/64$  in. is to be ground, the sections of the profile are drawn on the same sheet, one above the other, and the wheel is reset for each section. The work slide is then moved as each section of the workpiece is finished, the accuracy between the sections being maintained by the use

of the end gages and the dial indicators. If the connecting point is at a point on a curve or an angle, the location of the work slide is easily calculated. Work up to a total width of  $5 \frac{29}{32}$  in. can be ground by movement of the upper work slide. When the depth of profile exceeds  $25/64$  in., it can be finished in five sections to a depth of  $2 \frac{23}{64}$  in. by adjusting the lower work slide.

Aside from its function as a machine tool, the machine can also be used as a measuring tool for various

(Continued on Page 94)

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## Good Lighting Is Important

BY RICHARD S. NORTH

**P**OOOR Lighting—that robber of human eyesight—that sabotier of quality workmanship—is on the run. The era of working on machines and benches where practically the only light available was that furnished by perhaps a single incandescent light of comparatively low wattage is nearing its end. Factory owners and managers are awakening to the fact that money saved on lighting equipment is spent with interest in salvaging poor or spoiled work and in rectifying other conditions resulting from the inability of the workers to see clearly.

The attention of industry in general has been focused upon this important matter by the inauguration of the "Better Light—Better Sight" campaign, which has been fostered by the electrical and associated industries. The prevalence of poor lighting and the evils that result from such conditions had not received any great amount of attention up to this time, but the educational work which com-

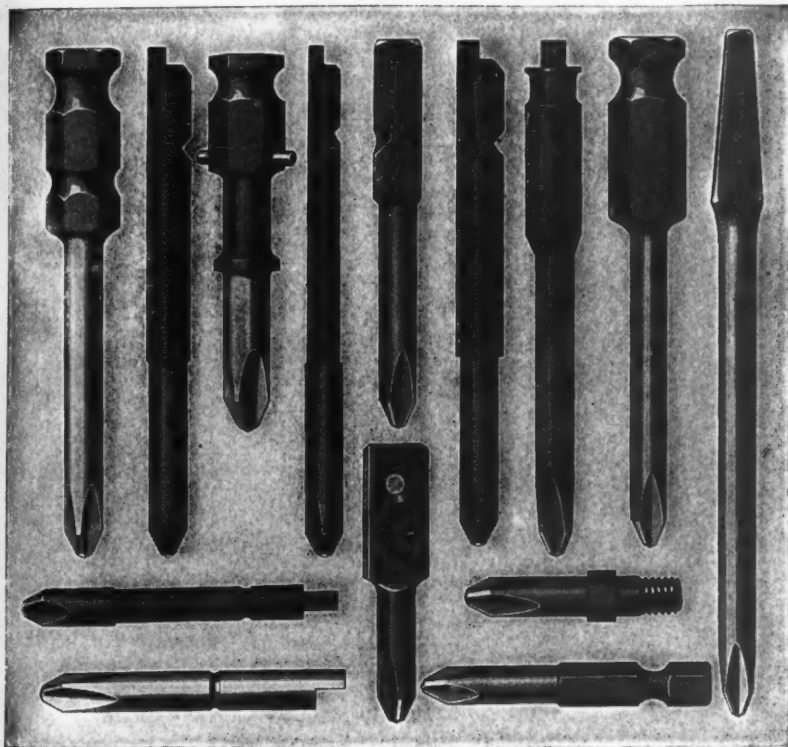
prised a part of the program has had its effect and it is to the credit of management as a whole that the movement is general to provide the workers with the best lighting available.

Executives who have made a study of the matter are familiar with the fact that poor lighting, through causing eye fatigue, eventually succeeds in limiting the proper functioning of the other parts and organisms of the human body. While the installation of proper lighting is truly a humanitarian measure, the serious endeavor to improve working conditions in plants and offices also benefits industry by improving the morale and efficiency and general health of the employees.

Doctors and scientists who have devoted much time to a study of the subject are unanimous in agreement that there seems to be no end to the disastrous effects upon the human system when we work continually—particularly on tedious work—under

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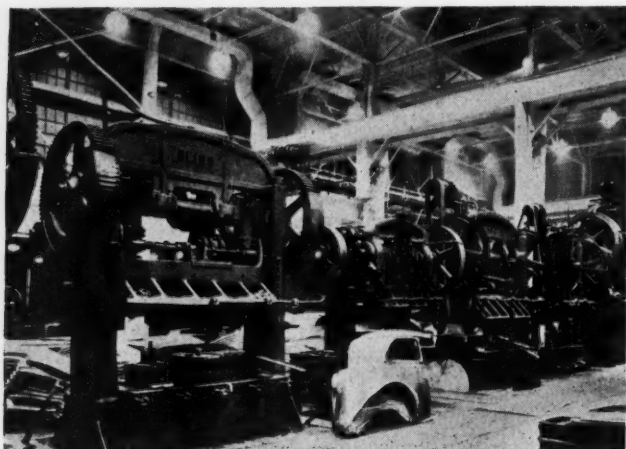
**★ THE APEX ★**  
**MACHINE & TOOL CO.**

Third and Madison Sts., Dayton, Ohio

poor illumination. Breakdown of the vision, disruption of the digestive system, and the placing of an undue strain upon our hearts are some of the undesirable results.

The natural solution to all of this is, of course, the use of proper types of lighting in our shops and plants. Not merely an increase in the wattage, however, will bring about the desired result. The proper quality of

be taken into consideration if the maximum results are to be obtained from these improved lighting systems, and this concerns the treatment of the interiors. In order to obtain the greatest light value from the lamps, to eliminate shadows as far as possible, and to reproduce as far as possible daylight conditions, the walls and ceilings should be treated so that they will serve as reflectors.



Interior of machine shop equipped with modern lighting system and painted with flat white paint.

light is important as well as the quantity. In addition, if the maximum efficiency is to be obtained, no glare can be countenanced. Instead, the light—both natural and artificial—must be properly reflected and diffused. To provide the correct type of lighting, as has been pointed out in articles on this subject in former issues of MODERN MACHINE SHOP, lamps of the modern type, such as the high intensity mercury vapor lamps, are being used quite generally.

All of that is well and good. However, as illuminating engineers will agree, there is another phase of this "better lighting" activity which must

from 84 to 92 per cent of available light; light tints such as light ivory and similar shades reflect anywhere from 80 per cent downward.

The best reflection and diffusion are obtained through the use of some of the better grades of flat and eggshell sheen paints, due to the fact that they eliminate the glare which is usually encountered where full gloss paints are employed. Then, too, some of the modern eggshell finishes possess washability which is practically equivalent to that of a full gloss finish.

Many interesting experiments have been made which have definitely es-

To cover the walls with mirrors, or with other expensive reflecting mediums, is a practical impossibility; the most logical method is to coat the walls with white paint of a quality good enough so that it can be depended upon to adhere properly and to afford the maximum of reflection. Good quality white paints have been found by test to reflect

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established the truth of these claims. The Pittsburgh Plate Glass Company has, for instance, conducted tests which have proved beyond the shadow of a doubt the splendid reflection and diffusion characteristics of the proper types of interior paints. For instance, a large room in which the walls and ceiling had been painted a deep buff color was found to have an average



Views of three different rooms from the exterior, showing two in which older types of lighting and dark wall tints prevail and one illustrating the improvement possible by the use of modern lighting equipment and wall tints having high reflectivity. White paint was used on the ceiling, and a light tint on the walls.

illumination of slightly more than four footcandles. For the type of close visual work done in this room, the lighting was inadequate. This conclusion was verified by the fact that some of the young ladies employed in this room complained continually of eyestrain and headaches.

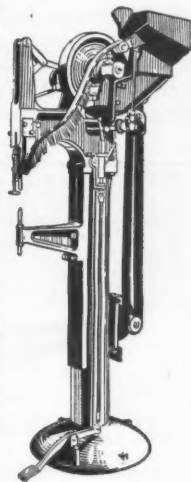
The room referred to was included in a series of tests in which both the

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● Chicago is the only rivet manufacturer making an automatic blade type riveter, capable of setting rivets of extreme length. Thousands of products can now have lower costs through use of long rivets.

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Automatic feed with blade type hopper for rivets of extreme length. Adjustable horn and anvil holder. Has 12" throat.

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Westinghouse and General Electric companies cooperated. For this room, it was decided to use the latest in totally indirect lighting. Four fixtures were installed, each of which utilized four 200-watt incandescent lamps and one 400-watt high intensity mercury vapor lamp. The total wattage was thus 1200 for each fixture, or 4800 watts for the entire room.

With the new lighting equipment and the walls still finished with the deep buff paint, tests with the light meter showed 45 footcandles of light at the working positions—an increase of 41 footcandles. It was then decided to repaint the room, using a good flat white on the ceiling and a light ivory flat paint on the walls. The approximate reflection factor of the

white paint is rated at 85 per cent and the light ivory paint, slightly over 70 per cent.

After repainting, the original lights were turned on and a test was made which showed that the mere change in the wall color had increased the reflection and diffusion of the light so that 71 footcandles were present. This increase in lighting efficiency from 45 to 71 footcandles merely through the use of paint clearly indicates that the latter must be given serious consideration in connection with any improvements in the lighting arrangements.

#### Light Reflection Factors of Wall Paint Colors

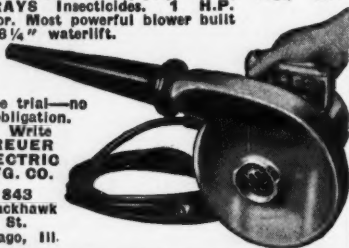
	Per Cent
White .....	85 to 90
Ivory .....	70.5
Orchid .....	70.5
Peach .....	68.5
Light Buff .....	68.5
Suntone .....	68.5
Blossom Pink .....	68.5
Seafoam Green .....	61.5
Horizon Blue .....	55.5
Dawn Gray .....	55.5
Maize Tan .....	55.5
Beige .....	55.5
Cascade Blue .....	51.5
Mist Gray .....	48.5
Palmetto Green .....	45.5
Spring Green .....	43.5
Dark Red .....	10.1
Dark Green .....	9.5
Dark Gray .....	9.5
Dark Brown .....	8.5

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when

# You

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**I**S there in your product a difficult place to reach in finishing? Try burs. . . Executives often fail to realize the many jobs these small, inexpensive, handy tools will do. A bur (or rotary file) can be shaped to do a particular job and reach that difficult place. Often a bur driven by a flexible shaft will do work that otherwise would be impossible or highly expensive. Burs do a better job than hand files, with a fraction of the effort.

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HARTFORD, CONN., U. S. A.

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## Modern Equipment at Work

### Saving on Tools Begins at Toolcrib

**A**N interesting example of the modern method of eliminating waste, reducing the inventory, and otherwise reducing tooling costs is found in the plant of the Watson Machine Company at Paterson, N. J., where a complete set of Lyon steel shelving and other steel toolroom equipment was recently installed to replace the wood racks and containers formerly used.

According to a statement made by the factory manager, the old wood racks, bins, and partitions were constantly under repair, necessitating practically a continuous expenditure for repairs. The well-known "hunt" system of locating tools and tool checks was used, as no systematized

method of keeping the tools in order could be maintained. Since equipping the toolcrib with steel shelving, steel tool racks, and steel cabinets, keeping order is a simple matter. Drills, reamers, taps, twist drills, jigs, dies, clamps, mandrels, and other tools are stored systematically in order of size each having its own separate compartment, and anything can quickly and easily be located.

An estimate of the savings that have been made to date indicate that the new installation will pay for itself within a few months. The obvious savings are those made as a result of keeping the tools in better condition, a reduction in inventory made possible through having a definite place for each type and size of tool, and faster tool checking service. The improved checking service has materially re-

duced loss of time by mechanics waiting for tools or checks. In addition to the foregoing, the Watson Machine Company also made a saving in floor space. In addition to more systematic stor-



Section of toolcrib at the plant of the Watson Machine Company, where the use of Lyon Metal Products steel storage bins and shelves has reduced the amount of space required by 25 per cent.

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**HAND  
CUTTING  
IS OUT!**

This No. 16 Unishear zips through 16 gauge hot rolled steel, other materials in proportion. Speed, as fast as you can feed it. Plugs in any light socket. Follows curves, angles, cuts any pattern. Leaves smooth finished edges. Other portable Unishears with capacities of 18 and 14 gauge hot rolled steel; stationary Unishears that cut up to 1/4" boiler plate. Ask your dealer for demonstration, or write for descriptive catalog. Stanley Electric Tool Division, The Stanley Works, 137 Elm St., New Britain, Conn.

**STANLEY UNISHEARS**

**THE ELECTRICALLY DRIVEN HAND SHEARS**

age, the steel equipment made it possible to handle the same amount of tools in 25 per cent less space than was required for the wood bins and shelves.

## Grinding Direct From the Drawing

(Continued from Page 80)

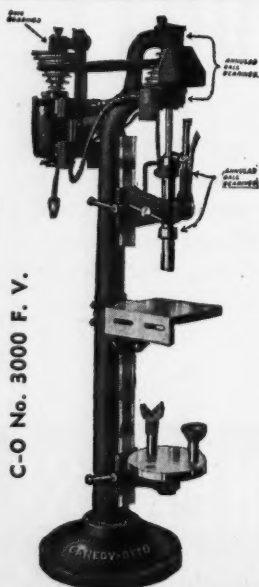
kinds of shapes. When so used, the process is reversed by aiming at a given contour through the microscope and marking the location of the needle, at intervals, by dots on the enlarged drawing of the piece. The dots can then be connected by lines and compared with a correctly drawn profile of the same magnification.

Some of the shapes that have been ground with this machine are illustrated in Fig. 7. In giving the grinding time for each piece it is assumed that the material is of medium

strength, that the workpieces have been rough milled, and that the work is done by an experienced operator.

**PORTER - CABLE SANDER - GRINDER BULLETIN.** A bulletin describing the Porter-Cable Take-About Sander-Grinder, as well as other sanding machines, has been issued by The Porter-Cable Machine Company, 302 Wolf Street, Syracuse, N. Y. Copy free upon request.

**ROSS OPERATING VALVES** for the control of a wide range of mechanical units are presented in a 24-page loose leaf catalog that is now being issued by Ross Operating Valve Co., 6488 Epworth Blvd., Detroit, Mich. In addition to the illustrations and descriptions of the various kinds and types of valves, blue print drawings are included showing the dimensions. Descriptions and illustrations of the Norgren Sight Feed Automatic Air Line Lubricator and Norgren Regulating and Reducing Valves for reduction of initial pressures to desired working pressure are included. Copy free upon request.



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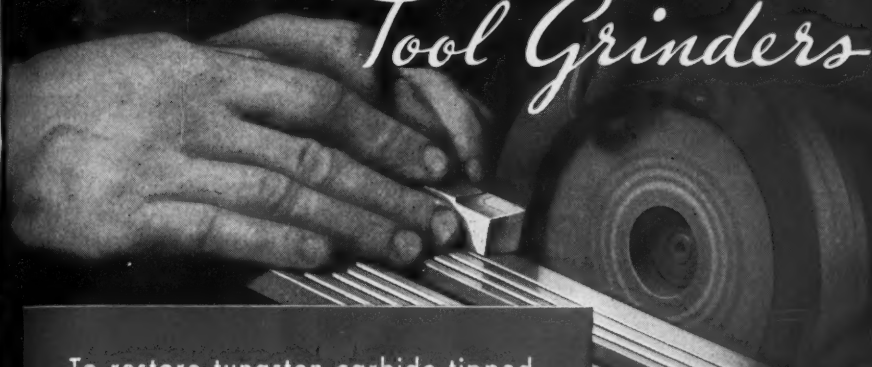
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To restore tungsten carbide tipped tools to precisely their original condition with the removal of a minimum of tungsten carbide stock; to duplicate new tool performance at each sharpening; and to provide sharper, more efficient tools and consequently greater accuracy and higher finish on the work: these are the important results being produced with Ex-Cell-O Carbide Tool Grinders. Through increased tool efficiency and materially lower sharpening cost, Ex-Cell-O Tool Grinders have proven their ability actually to pay for themselves. There is a type to meet every requirement whether for use in the largest manufacturing plant, or the most modest tool shop. Send for complete information.

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**GENERAL PURPOSE SAWS**

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Extremely low priced  
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**A NEW MARVEL  
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New principle of  
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A Moderately Priced Hack Saw that will out-cut all others in its price class. A really good high-speed hack saw for ordinary miscellaneous or occasional work, although of course, not the equal in efficiency and stamina of our heavy-duty, full ball bearing, production models: Nos. 6, 6A, 9 & 9A.

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makes it possible to manufacture this jack reasonably. Upkeep costs are negligible as only the points will require any special attention.

## How Much Power Does a Bearing Absorb?

BY W. F. SCHAPHORST

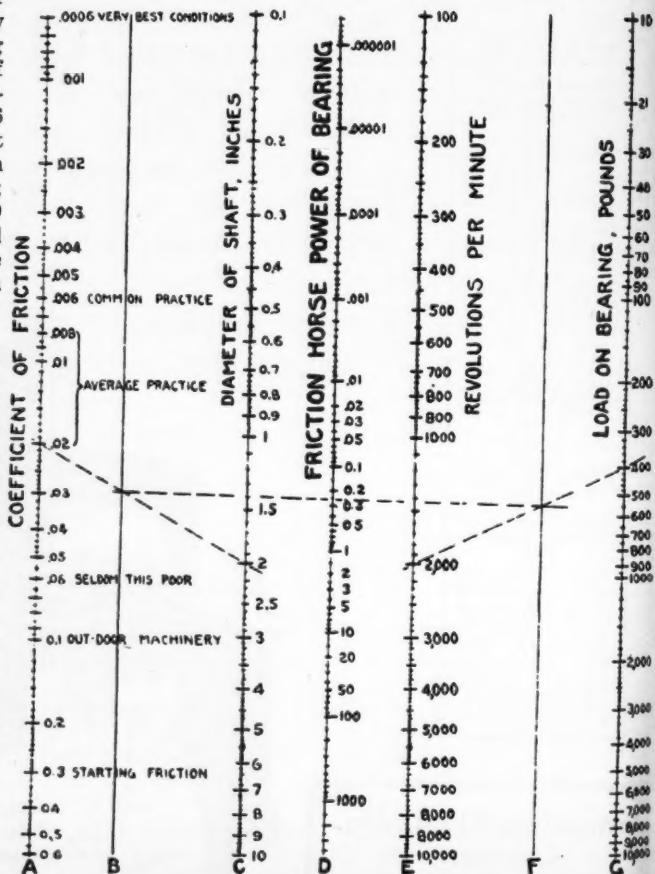
**L**AY a straightedge across this chart three times, as indicated by the dotted lines, and it will give the horse power consumed by any bearing coefficients of friction varying from .0006 to 0.6; shaft diameters from 0.1 to 10 in.; r.p.m. from 100 to 10,000; and the load on the bearing from 10 to 10,000 pounds.

For example, using a coefficient of friction of .02 (Column A), which is average practice; a shaft diameter of two inches (column C); a speed of 2,000 r.p.m. (column E), and a 400-pound load on the bearing (column G), column D gives the friction horse power as a little over 0.25.

Connect the known value in column A

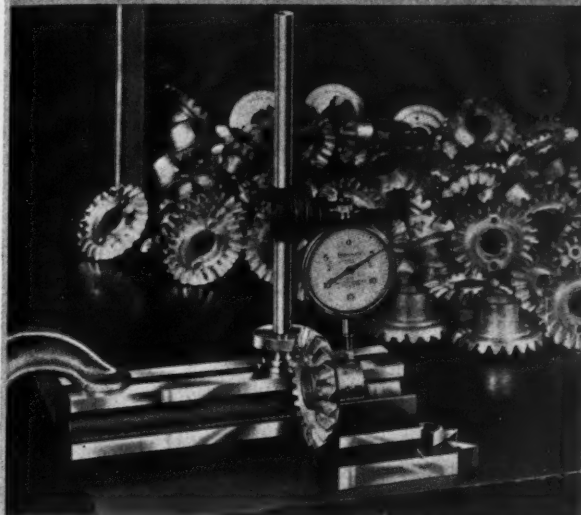
with the known value in column C and locate the intersection with column B. In the same way connect columns E and G, and locate the intersection with column F. Lastly, connect the intersections (columns B and F), and the intersection with column D gives the friction horse power of the bearing.

Column A gives an idea as to coefficients of friction met with in everyday practice, beginning with the very



The horsepower consumed by any bearing, coefficient of friction, and load can quickly be determined from this chart.

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THROUGH  
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**A** STARRETT No. 665 Dial Test Indicator and a Starrett No. 567 V Block make an ideal combination for production inspection of a wide variety of parts. In the picture they are shown set up to check the hub diameter of bevel gears.

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Starrett Revised Catalog No. 25MD and the Special Starrett Dial Indicator Catalog illustrate and describe the complete line of Starrett V Blocks and Dial Indicators as well as more than 3000 other Starrett Tools. Write for them.

**THE L. S. STARRETT CO.**

*World's Greatest Toolmakers  
Manufacturers of Rockwell Unexcelled  
Steel Tapes—Standard for Accuracy  
Athol, Mass., U. S. A.*

# Starrett Dial Indicators

best conditions and ending with starting friction. Only the general safe values of practice are designated on this chart. The principal function of the chart is to quicken the making of computations for anybody who has to do with bearings.

The chart, of course, can be used backward as well as forwards. Thus if the power absorption by a given bearing is known, and if values in columns C, E, and G are known, the coefficient of friction is quickly determinable. Then, knowing the coefficient of friction with a given oil and in a given bearing, the power required by a similar bearing of different diameter, speed, and loading may be found with an accuracy sufficient for most practice.

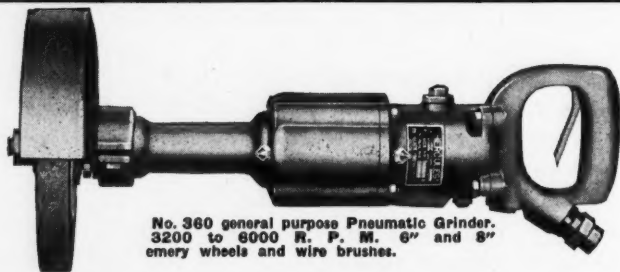
This chart explains many things—teaches many lessons. For example, for belt transmission practice it tells us to run belts with as little tension as possible; to run shafts at low speeds

if possible; to use small shafts preferably; and to keep the bearings well oiled, with the proper oil, and in good condition.

## Method of Preventing Bolts from Turning

BY JOHN S. HYLER

**I**N the assembling of blades to heavy grading equipment, it is necessary that the head of the bolt lie flush with the surface of the blade; thus a taper or countersunk head bolt of the "ploughshare" type is used. Inasmuch as there is no part of the head projecting upon which a wrench can be used, it is necessary to use some other method of preventing the bolt from turning when the nut is being tightened or loosened. This is accomplished by using a special bolt which has a projecting fin under the head, as shown.



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3200 to 6000 R. P. M. 6" and 8"  
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"LOWER  
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"LONGER TIME  
BETWEEN RESHARPENING"



"BETTER WORK"



"FASTER CUTTING"



*but* **THEY ALL AGREE...**

# THERE IS A DIFFERENCE

The executive sees it in lower production costs. The tool room foreman in longer time between sharpening. The shop men themselves in better work — in faster cutting.

If you are of the opinion that there is no difference in metal-removing tools, try Morse Tools your own way in your own shop. It will pay you to prove "There Is A Difference."



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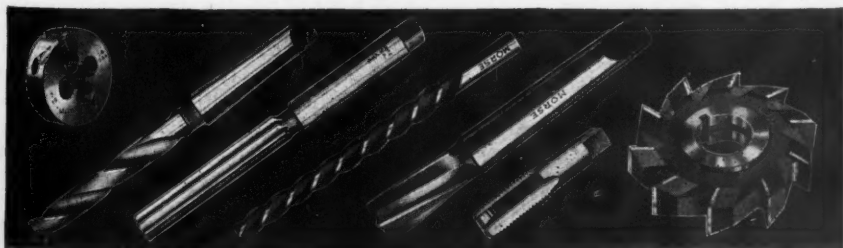
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It should be clearly understood that "Morse Taper Shank" is a general term and may apply to the product of any manufacturer. It does not necessarily indicate a genuine Morse product. Specify Genuine Morse Tools.

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## THE POOR FELLOW'S TRYING!

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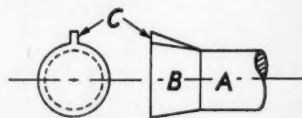
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# Zip-LIFT

**STOPS WASTE  
WITH "SPOT HANDLING"**

In order to use the bolt described, it is necessary that a corresponding slot be made in the tapered seat of the hole. The slot does not have to be accurate, other than that it must be in line with the center of the hole so that the projection on the under side of the bolt-head may fit into it without difficulty.

Several methods of grinding the slot in the bolt-head seat were tried before it was discovered that the simplest was also the best. This method consists in using a small thin



Drawing illustrating method of preventing countersunk head bolt from turning in the hole.

grinding wheel on a portable grinder. The edge of the wheel is brought to bear directly across the center of the hole, producing two slots—one on each side of the hole. It is relatively easy to center the wheel in the hole, since the exact center is the path of least resistance for the grinding wheel and the tendency is for it to seek the lowest spot, which is the center, before settling to the cut.

## Inspecting Bores in 75 mm. Gun Recoil Mechanism

By A. L. DE LEEUW

**R**EADING the article, "Inspecting Hollow Cylindrical Bodies with a Movie Camera," by Rene W. P. Leonhardt in the November issue of MODERN MACHINE SHOP, I recalled a method I devised for examining bores in the main member of the recoil mechanism of the 75 mm. French guns.

There were two of these bores, both

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63 in. long, one with a diameter of practically  $1 \frac{9}{16}$  in. and the other  $2 \frac{1}{2}$  in. Besides being held to very close limits as to roundness, straightness, and size, the holes had to be finished to a mirror polish.

The method I employed to examine whether the finish was that of a true mirror was devised after I had first used a periscope but found this method entirely too slow and not entirely sure. Too much dependence was placed on the human element. The method I used, therefore, after the first two or three pieces had been inspected was the following:

A brass cap was inserted at each end of the bore to be inspected. The cap at one end consisted of a short section of tubing, which fitted the hole, to which a disc of very thin brass was attached, closing the end. A fine pin-hole was drilled in the center of the brass cap. The cap at the other end of the bore was of similar construction, except that the end metal did not need to be so thin, and that the central hole was about  $11/32$  in. in diameter.

When examining the bore, both caps were put in position and a concentrated light was placed behind the fine pin-hole. Upon applying the eye to the hole in the other cap, one would see a bright, narrow ring of light halfway down the length of the bore, and a fainter ring of light at one-fourth and three-fourths of the distance. Otherwise no light would be seen, if the bore had a true mirror finish. If the finish were not correct, other light spots would be seen. This method would enable the inspector to pass on the finish in one minute or less.

It would be possible to arrange things so that one would see more than three light rings. It is even possible to see only one. If the light source is sufficiently concentrated and is at just the proper distance from the small pin-hole, then it may very well be that the only place from

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# How to find the right tool steel for the job!

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which that light can be reflected and strike the eye is just halfway. But this would require very accurate placing of the concentrated light.

If one is satisfied with the three rings as described above, it is not necessary to locate the concentrated light quite so accurately. There is quite some leeway possible.

This method is not recommended for examining bores in general. It only applies if the hole is finished to a high polish.

## Progressive Die for Economical Production

By C. W. HINMAN

THE drawing Fig. 1 shows the blank development of a sheet metal float arm that is used in a popular make of electric refrigerator. The piece is made from material that is 0.0625 in. thick. Figure 2 is a drawing of the press tools with which

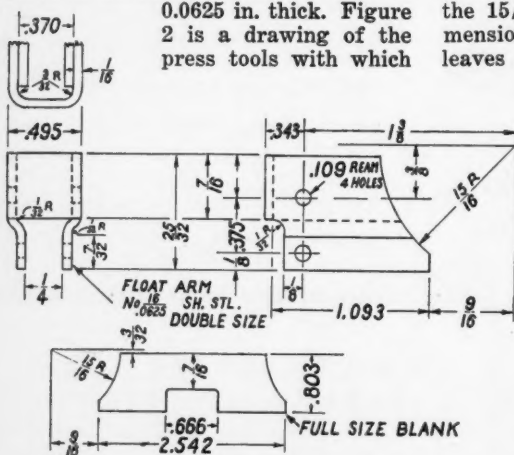


Fig. 1—Drawing of sheet metal float arm for electric refrigerator.

the piece is made, presenting the plan and front elevation. The die set is purposely omitted in order to avoid confusion of lines.

The tool members A, B, and C are independent die blocks and D is the punch holder plate. The material strip F is purchased in large rolls, the width of the material being the same as the developed width of the blank. A positive-type channel stripper plate G is anchored in place on the die face, the channel width being 0.005 in. wider than the material strip that is to be guided through it.

The strip roll is vertically mounted on a ball bearing floor reel at the right of the press, and the strip, as it unwinds from the roll, passes through a commercial "hitch feeding" device (not shown) and enters the die through the stripper channel at M. With the hitch feed disengaged, the end of the strip is inserted by hand and is stopped at the first finger stop I when the stop is depressed.

As the ram descends, punches J and K, each with backing heels as shown at L, notch the strip edges to the 15/16-in. radius and 0.666 in. dimensions, respectively. Punch J leaves a neck of metal in the strip 1/8 in. wide, as shown in the die plan. The neck connects the successive blanks, but is eventually cut out as waste.

In advancing the strip by hand into the second station against the depressed finger stop M, and tripping the press, the bullet-nose pilot punch N enters the previously-notched 0.666-in. opening and positively registers the strip. After the ram has ascended, the operator engages the hitch-feed and the tool and work are ready to run automatically.

In automatically advancing into the third station, the strip passes over the cutting-off die O, where it is severed by the descent of the punch blade P. This cut removes

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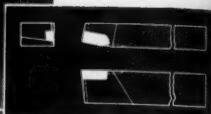


Diagram of Vascoloy-Ramet tools used in this operation, Style 11,  $\frac{1}{2}$ " square. Grade DW, for steel cutting, hardness: 89.6 Rockwell "A." Strength: 297,000 lb. per sq. in. cross rupture test.

Machining Automobile fan drive pulley. Material: spun steel. Operations: facing flange  $4\frac{3}{8}$ " to  $2\frac{3}{4}$ " diameter at section faced, turning O.D. of hub  $2\frac{1}{2}$ " diameter. Performance of Vascoloy-Ramet Tools, Grade DW

Vascoloy-Ramet	Speed	Feed	Depth of Cut	Pieces per Grind
Grade DW	587 R. P. M.	.0098"	.007" to .013"	1,000

With Vascoloy-Ramet, the tantalum carbide tool material, "A grade for every use," is no mere catch-phrase.

Produced in 17 standard grades, of different tantalum content, strength and hardness, it alone covers the entire range of machinable materials and meets every machining requirement.

This is one reason for its rapid and widespread acceptance as the preferred tool material. One reason why, in plants throughout the country, new records are being made for pieces per grind, for

greater speed from floor to floor, and for lowered machining costs.

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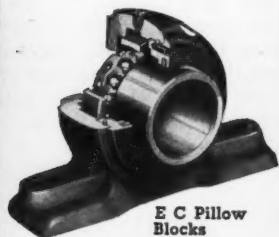
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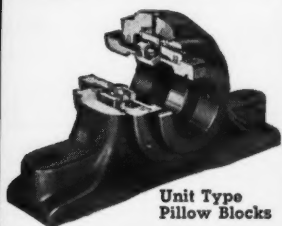
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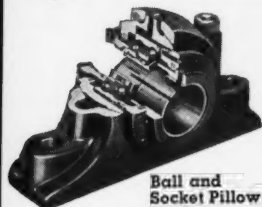
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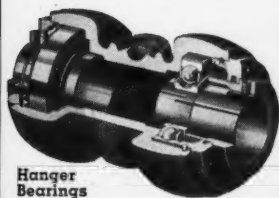
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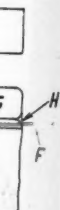
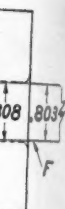
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the punch continues downward, it forces the bottom of the pad to positively register in the die shoe at the instant of maximum crank stroke. This action "spanks" the formed wings to an exact angle of 90 deg. to the bottom across the piece and, therefore, parallel with each other.

When the ram ascends, the work is carried up with the punch, due to the action of the spring pressure pad beneath it. Continuing the ascent, the pad eventually resumes its normal position, with the pad-face flush with the die-faces. The work, still adhering to the punch, is finally stripped off when it contacts the stripper fork T.

The press being tilted toward the rear, the pieces fall by gravity into a container placed between the press frames behind the machine. The four 0.109-in. holes must be perfectly aligned, and for this reason are subsequently drilled and reamed in a jig.

**COLONIAL UTILITY PRESSES.** The complete line of nine models of Colonial Utility Broaching Presses, ranging from 6 to 15 tons in capacity, and with strokes from 18 to 36-in., is described in this four-page bulletin which is now being issued by Colonial Broach Company, 145 Jos. Campau St., Detroit, Mich. Copy free upon request.

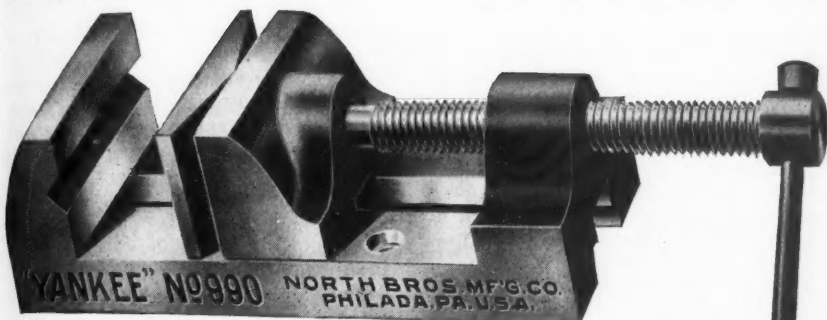
**NATIONAL TWIST DRILL ENGINEERING BULLETINS No. 131 and 132.** These bulletins, which have been issued by the National Twist Drill & Tool Co., Detroit, Mich., comprise (No. 131) a concise and comprehensive table of feeds and speeds for milling and (No. 132) an explanation of the table and the manner in which it should be used. The feature of the table consists in the correction factors, which are provided for a wide range of metals embracing screw stock, tool steels, alloy steels, cast iron, cast steel, malleable iron, brass and bronze, Monel metal, magnesium alloys, and aluminum. Feeds and speeds for any of these materials, at any depth and width of cut, can quickly be computed. Copies of these bulletins are available to any mechanical executive who will address his request on his firm letterhead.

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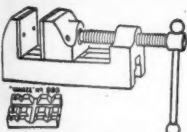
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## Vises to Add

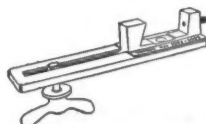
speed and accuracy needed  
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Above, "Yankee" Vise No. 990.—Without Swivel Base. Accurately machined to support work squarely on face plates. Front jaw made with V-groove, to hold round work rigid and parallel. Tapered pieces securely held by swivel jaw of case hardened steel, removable from Vise. Jaw width,  $2\frac{3}{8}$ ". No. 990 is fastened to bench or face plate with "C" clamp or screws. Not designed for use with "Yankee" Vise Clamp.



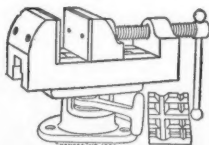
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"Yankee" Vise Clamp. Attaches vise to face plate. Made for use only with "Yankee" Vises No. 992, No. 1992, No. 993, No. 1993.

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993, No. 1993. Assures rigidity and accuracy, for drilling and machining operations. "Yankee" Clamp permits of shifting work to various positions for tapping, filing and the like, without removal from face plate. Two sizes: No. 2992, length  $9\frac{3}{4}$ ", is for "Yankee" Vise No. 992 or No. 1992. No. 2993,  $10\frac{1}{2}$ ", for Vise No. 993 or No. 1993.

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# "YANKEE"

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## Over the Editor's Desk

### Time Marches On!

**T**HE year 1936 has passed into history. For another twelve months the world has gone through the motions of progress; whether or not it has really progressed is a matter for debate. What we are most concerned with is whether or not we, individually, have progressed. Has each one of us added to his capabilities during the past year? Have we individually made any preparation for better positions in the affairs of our respective firms and communities? Or are we right where we were a year ago, insofar as our abilities are concerned?

Many who read this page will dismiss these questions with the answer that there are no opportunities ahead for them. Too often a man who has been in a job for several years develops a feeling that the men who have the bigger jobs will hang onto them indefinitely and that it will be years before there will be a chance for a promotion.

The man who has that idea is consciously or unconsciously fooling himself. He is suffering from a chronic attack of inertia, for which there is no cure.

You, Mr. Reader, count up the better jobs that exist in your organization. Look back and note the changes that have taken place in your firm in the past few years. Changes will be made again, perhaps this year. The jobs are all filled now—but they won't always be.

It is impossible to put one's finger on the job that will be open before the year is out, but the law of averages say that a certain number of changes will be made, and men will have to be found for every one of these jobs. A certain number of top executives will pass; others will re-

tire; some will change from one company to another; a few will head up their own

companies, and many others will make changes which cannot be foreseen at this time. In practically every instance a job will be left open which most likely will be filled by the person best equipped for it. In some cases the retirement of one person in an organization will mean promotions for half a dozen people, none of whom could see the possibility of anything better ahead for him.

What a fine thing it would be for the tool setter or assistant foreman if he could look ahead fifteen years and see himself as the master mechanic of the plant; or for the foreman if he could look into the future and see that in a definite period of time he would be general superintendent; or for the general foreman if he could know that at the end of that time he would be the works manager, and so on. These suppositions will become facts in many cases, but only for the men who are big enough to fill the jobs ahead.

Have you, Reader, made any preparation during the past year that would fit you for a bigger job if it should open up tomorrow? If not, you haven't progressed an inch. You have stood still, and if no one in your firm had made any more progress than that, you could look out of the window and see the sheriff coming up the walk now. Let's get down to cases.

Mr. Toolsetter, or Assistant Foreman: Have you made yourself familiar with the operation of all the other machines in your department other than those you have to set up or supervise? Do you know how to allot the work to the machines in your department so as to meet production schedules? Have you been studying your foreman's work so that you could handle the department if it became necessary?

You, Mr. Foreman: Have you made yourself familiar with the principles of operation of all the other machines in the plant? Do you know the relationship of one department to another and could you supervise the production in several departments tomorrow if you were made general foreman? Would you know how much production to expect from each type of machine, and are you posted on modern types of machines for such work? Have you familiarized yourself with the general principles of foundry practice, and do you know how much allowance has to be made for machining on different kinds of castings? Do you know die casting technique? Do you have at least a rough idea of the principles of metallurgy and the physical characteristics of modern metals? Do you understand the principles of tool design, so that you can offer suggestions if they are called for? These items are important if one expects to climb very far.

Are you, Mr. General Foreman, acquainted with the work that is done in each department of the plant? Are you keeping posted on the various types and kinds of equipment available for all of these operations? Have you taken a definite course of study to learn the intricacies of heat treating steels to produce the best results? Are you posted on modern methods of plant layout, so that you know whether or not your firm is wasting money on material handling? This information will be necessary if you are going to fill a superintendent's job successfully.

Mr. Superintendent: Are you familiar with every operation in the plant and the kind of machines and equipment used in these operations? Could you tell by the routing sheets whether or not each part was being processed in the most economical manner? Do you know the production costs on each minor and major unit? Do you know how many men each department

should have to turn out a given amount of production? Do you, also keep posted as to the newest types of equipment, so that you can recommend changes which will reduce costs? You will have to know the right answers in order to be a first class works manager.

How about you, Mr. Inspector: Do you know what part each piece plays in the assembled unit, and why certain allowances as to fit and tolerances are made? Could you tell whether or not a spoiled piece could be salvaged without damage to the finished assembly? Do you know why certain pieces have to meet certain specifications as to strength and hardness? This information will be valuable if you aspire to be a chief inspector.

Mr. Toolroom Foreman: What have you done this past year to fit yourself for a greater opportunity? Are you familiar with the general construction of all the various production machines, so that you could supervise the repair of any one of them? Have you studied the weaknesses of the machines that give the most trouble, and could you recommend alterations that would keep them running? A good master mechanic has all of these on his mind, besides keeping an eye on your tool-making department.

The fellow who said that Opportunity comes but once was only half right. It comes once to every man, but if the man upon whom it calls is not prepared to receive it, it may never come again. To the man who has the price ready at the first call it may come again and again—each time with a more valuable jewel. For Opportunity has no gifts; Opportunity is Time's salesman. Its wares are the higher places and the finer things of life, and the price is preparation.

Make 1937 a year of personal progress!

## New Shop Equipment

### Sundstrand Automatic No. 2 Electromil

The illustration shows two views of the Sundstrand Automatic No. 2 Electromil, which has been brought out by Sundstrand Machine Tool Co., 11th St. and Harrison Ave., Rockford, Ill. This machine is a smaller type of the Rigidmil, with automatic electric table control, and is especially intended for high speed milling on small parts.

The machine can be set up or changed from one job to another very quickly. This quick set-up is an outstanding feature of the machine, inasmuch as it makes possible low cost milling on parts manufactured in small quantities. According to the manufacturer, this machine approaches the economy of a special machine, without entailing investment in a large machine or expensive tools and fixtures. The convenience in setting up, simplicity of tooling, reliable high speed automatic operation and great durability adapt the machine particularly for continuous operation on long-run work.

The machine has the heavy base, rigid column, patented rectangular overarm,

and adjustable spindle head which are features of Sundstrand Rigidmills. The unusually rigid support for arbor and spindle and the effectiveness of the anti-backlash arrangement available for the purpose, make climb cutting as practical as the conventional method of milling.

All table movements are governed accurately and dependably by a simple master switch or control box conveniently located at the front of the machine. A single lever provides manual control of all table movements for setting-up purposes. Movement of the lever toward the operator starts table rapid traverse smoothly to the right and a light pressure on the lever, sufficient to move it past "neutral", will halt the rapid traverse instantly. Swinging the control lever to vertical or mid-position starts table feed to the right; a light pressure inward stops the feed, and by swinging the lever to the left, the operator can start or stop table rapid traverse to the left. Return of the lever to mid-position establishes table feed to the left.

The automatic operating cycle of the Electromil is easily established by adjusting dogs under the guard rail.

The No. 2 Electromil is equipped with

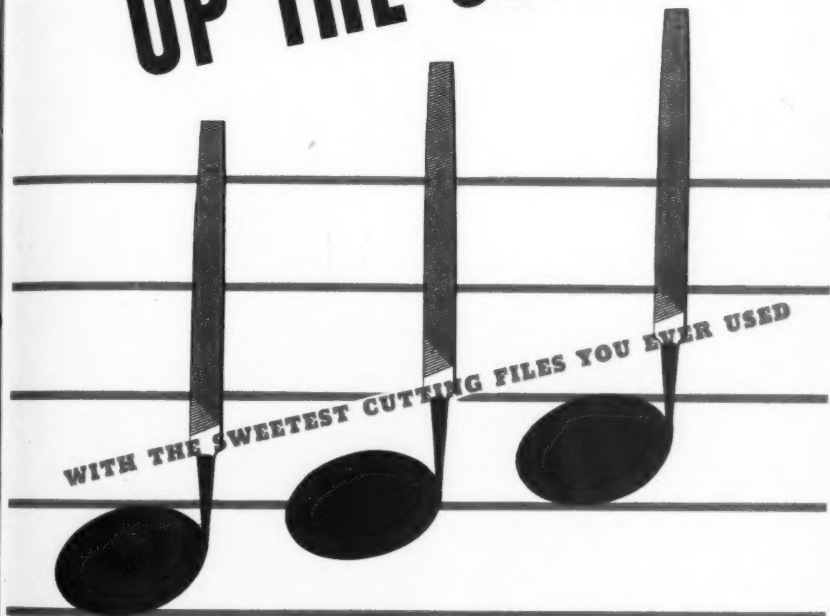


Sundstrand Automatic No. 2 Electromil

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# UP THE SCALE



## OF PRODUCTION EFFICIENCY

With the first stroke on metal the mechanic knows that Nicholson, Black Diamond and McCaffrey Files are "sweet cutting files."

These files start cutting with a minimum of effort. They cut easily and rapidly—stroke after stroke. They stay on the line of work and do not tend to skid off to one side or the other.

Because of their modern tooth construction, Nicholson, Black Diamond and McCaffrey Files are sweet cutting files and fast cutting. In an impartial hand test, one of our new 12" flat

bastard files removed

35% more bronze

25% more cast iron

than ordinary 12" flat bastard files.

Nicholson, Black Diamond and McCaffrey Files are the only ones with the tooth construction that makes this performance possible.

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These Brands*

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**BLACK  $\diamond$  DIAMOND**  
**McCAFFREY** 

*A File For  
Every Purpose*

three motors besides the coolant pump unit. One motor drives the spindle; the other two drive the table feeds and rapid traverses. A  $\frac{3}{4}$  h.p., 1800 r.p.m. motor supplies power for table feeds through a worm wheel reduction and gear train which includes pick-off gears with which feed rates of from  $\frac{1}{2}$  in. to 80 in. per minute can be obtained. Rapid traverse rate is 400 in. per minute, obtained through a  $1\frac{1}{2}$  h.p., 1800 r.p.m. torque type motor with solenoid brake and governor-controlled lock. A jaw clutch disconnects the rapid traverse motor when the hand lever is operated so that the table can be adjusted by hand. The spindle is driven by a face-mounted motor with built-in solenoid brake running at 1600 to 1750 r.p.m.

The spindle head is a compact self-contained unit gibbed to the vertical column with ample provision for take-up. All spindle head shafts run in anti-friction bearings and interior gears run in an oil bath. Adjustment of the spindle head is facilitated by the anti-friction mounting of the accurately adjusted threading screw, a large hand wheel and a clearly marked micrometer dial.

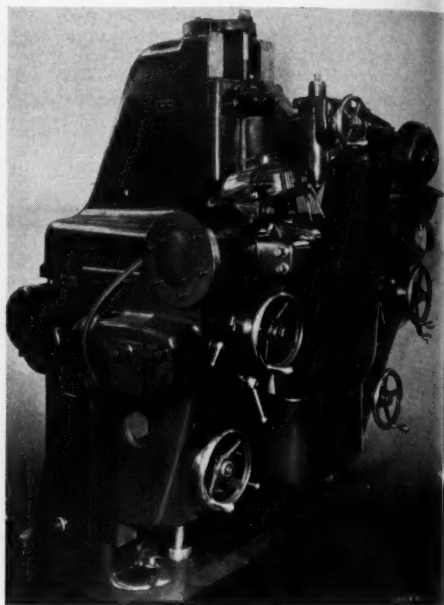
The machine is made in two sizes: 18-in. and 24-in. Twenty-seven feed changes are available on each machine, in three ranges of six changes each. Four ranges of speeds are available from 40 to 417 r.p.m., 60 to 629 r.p.m., 117 to 1233 r.p.m., and 173 to 1813 r.p.m., for each size of machine. A self-contained coolant pump with independent motor drive is mounted in the rear of the machine base. The spindle head and feed box gears run in oil baths with convenient sight gages and the table ways and screws have forced feed lubrication. No manual lubrication of working parts is required. Base dimensions, 40x45 in.; height, 64 in. Weights, 5200 and 5300 lbs. respectively.

### Michigan Duplex Gear Finisher

Designed to meet gear finishing requirements of manufacturers who do not have sufficiently long production runs to take full advantage of the long tool life, lowest possible tooling cost per piece, and minimum production time of the rack type of Michigan gear finisher, a new two-cutter, crossed axis, rotary machine has been placed on the market

by Michigan Tool Company, 7171 McNichols Road, Detroit, Michigan.

This machine offers to the smaller gear producer or one who is faced with the problem of producing a large variety of only a few gears each, a lower initial machine cost and lower initial tooling cost. The sturdy construction permits fast cutting with maximum accuracy by minimizing deflection. In this Duplex finisher the gears are mounted between



General view of the Michigan Duplex Gear Finisher showing the sturdy construction. The machine is notable for its extreme flexibility and adaptability to every type of gear-cutting job.

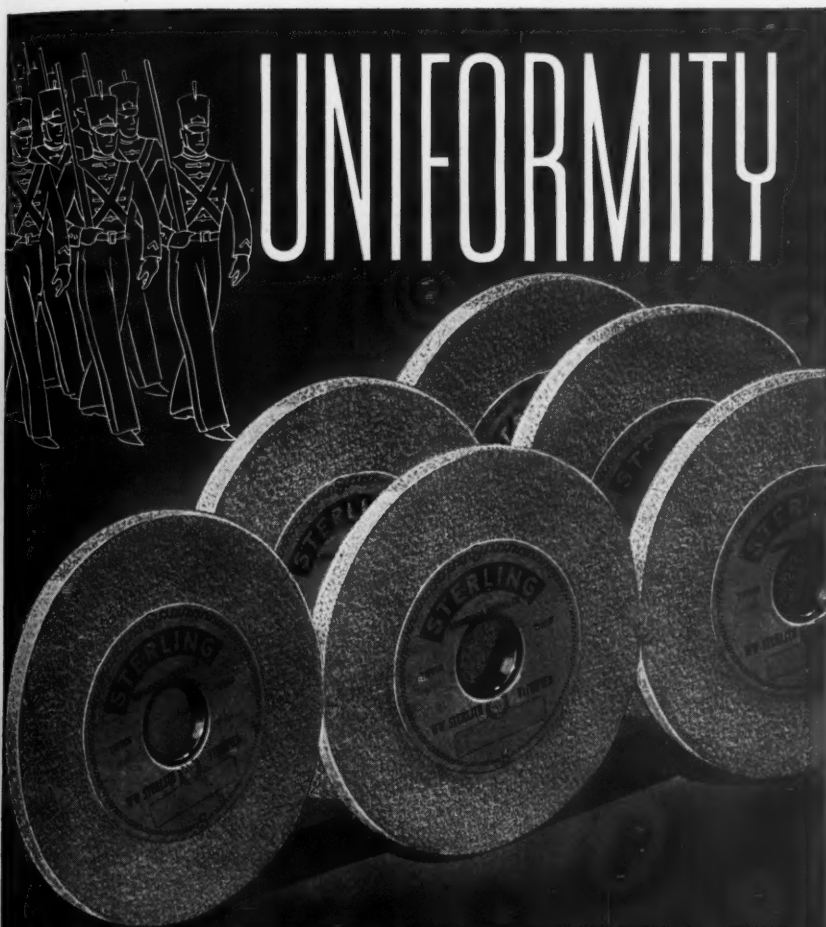
centers and are passed between two crossed-axis cutters toward the rear of the machine during the working stroke.

A feature of the machine is that the two cutters can be used independently to finish simultaneously two gears of different characteristics in a cluster on both right and left hand sides of a helix-bone gear, thus eliminating duplicate machines and cutting loading and cutting time in half. This is made possible by making the two cutters separately adjustable as to height, position with reference to axis of gears, and amount of crossed axis setting. A

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● Sterling wheels have long been recognized as of uniform structure, uniform grades and uniform action in grinding and cutting.

A uniform product brings to its users the utmost in service, production and low costs. Sterling uniformity will give you all three.

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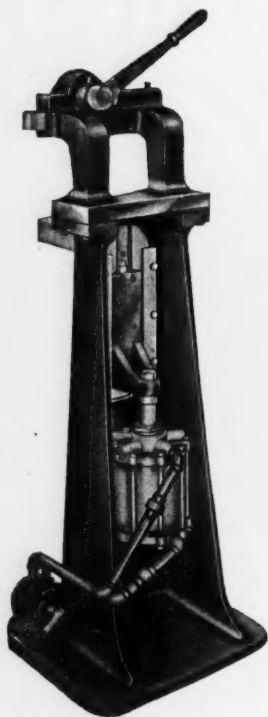
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Abrasive Division of The Cleveland Grinding Co.

## STERLING ABRASIVES

# MARKING

## FLAT—ROUND IRREGULAR SURFACES BY ROLLING OPERATION



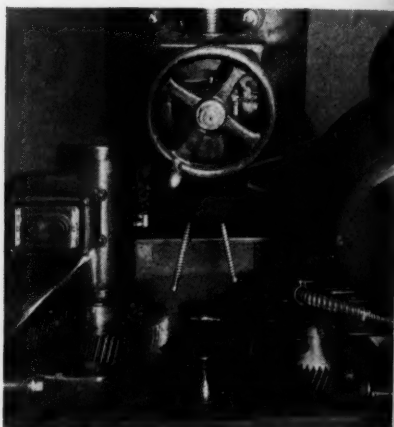
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This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. HI-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

**GEO. T. SCHMIDT, Inc.**  
1806 BELLE PLAINE AVE.  
CHICAGO, ILL.

shown in the detail view, cutters are set to cut a single helical gear.

Adjustment for correct location of cutter axis is by two hand-wheels to right and left of the work, while adjustment for height is by two hand-wheels below the other two. Adjustment for crossed-axis setting is by worm and wheel adjustments in the cutter carrying heads. This crossed-axis setting results, as in the rack type of machine, in creating a sliding action lengthwise of the teeth as the cutter and work are rotated with the cutter and work teeth



**Detail of the new Michigan Duplex Gear Finisher showing two cutters which can be set to finish two different gears of a cluster simultaneously.**

in mesh. Graduations in degrees are provided on the cutter carrying heads for adjustment of amount of crossed axis desired, or measuring pins may be furnished for this setting.

At the time of loading the work into the machine, the work carrying centers are toward the operator with respect to the cutters. Feed is obtained by moving the work carrying head away from the operator toward the rear of the machine, the work thus passing through the cutters. It will be apparent that when the center of the work is in line with the centers of the cutters that the gear will be finished to size.

Feed of the work back and forth through the cutters is by individual motor drive through reduction gears or rapid return may be obtained by pro-

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MANCHESTER, CONN.

vision of separate motor drive, so that working or return stroke speeds can be readily varied by changing pick-off gears.

The cutting fluid pump and a cutting fluid tank made in several sections in order to maintain lubricant free from dirt or chips are built into the base of the machine.

### Delta 17-In. Drill Press

Delta Manufacturing Company, 600-634 E. Vienna Ave., Milwaukee, Wis., has brought out a 17-in. drill press designed



Delta 17-In. Drill Press

to serve the needs of the general machine shop, tool room and production shop. Advanced engineering is evidenced

throughout the design and many built-in features adapt the machine to a wide range of jobs. The machine is 66 in. high, 18 in. wide and 27 in. front to rear. The floor base has a 10x13 $\frac{3}{4}$ -in. table surface, slanted for T-bolts. A bench type production base is available with a 20x20-in. table surface and oil trough extending around the table. For the floor type model, either a 11x12-in. tilting table or a 12 $\frac{1}{2}$ x17-in. production type table is available. The column is 3 $\frac{1}{2}$ -in. diameter, of heavy walled tubing, ground and polished. The maximum capacity of the drill is  $\frac{3}{4}$  in. in cast iron.

An extra large spindle pulley provides for five speeds; 385, 600, 935, 1450 and 2240 r.p.m. The pulley shaft runs in self-sealed ball bearings, lubricated for the life of the bearings. The pulley is of the floating type; thus none of the belt pull is transmitted to the spindle.

The spindle is keyed to the pulley. The lower end of the spindle is machined to form a 16-tooth automobile type spline which slides in a floating sleeve, internally splined to fit. The sleeve and quill slide on the spindle, instead of the spindle moving to the pulley. The spindle is carried at the lower end of the quill in two self-sealed New Departure ball bearings, preloaded and closely spaced, which makes the spindle free-running and rigid. The spindle is available either with socket for No. 2 Morse taper or with  $\frac{1}{2}$ -in. capacity Jacobs chuck.

The table on the floor type machine is fitted with a gear and rack raising and lowering mechanism, the same mechanism being used on the head of the bench type machines. A built-in foot feed is available if required.

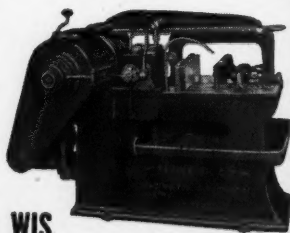
One of the features of the machine is that the heads can be used as units to build up special drilling fixtures. Their low cost makes them economical and it is possible to use a number of heads together by linking the foot feeds to a common lever.

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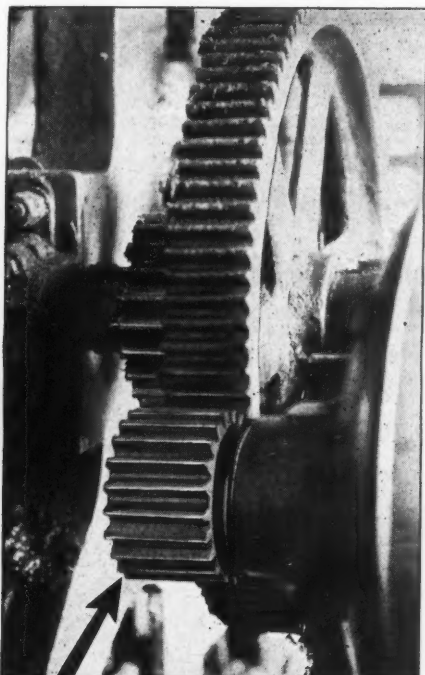


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# FORMICA GEARS

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Because they banish noise they make machinery easier to sell, and for the same reason they are popular with maintenance and production men whose job it is to keep machinery running smoothly and get out the work with the least wear and tear on men and machines.

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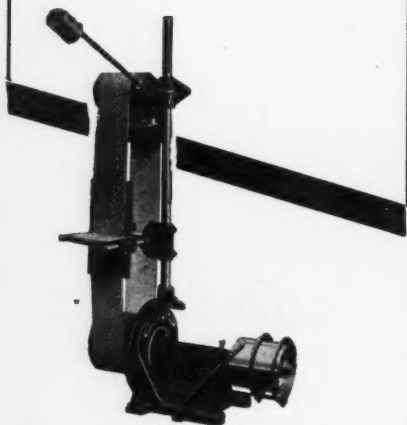
Cincinnati, Ohio

**FORMICA**

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- Gear Specialties, Inc.  
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- Clarksville Foundry &  
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- The Horsburgh & Scott Co.  
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- The Stahl Gear & Machine  
Co., Cleveland, O.
- The Master Electric Co.  
Dayton, O.
- The Adams Company  
Dubuque, Ia.
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- Beatty Machine Works  
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- Badger State Gear Co.  
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- Sier-Bath, Inc.  
New York City, N. Y.
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Supply Co., Pittsburgh, Pa.
- Perkins Machine & Gear Co.  
Springfield, Mass.
- Winfield H. Smith, Inc.  
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Handles a wide range of work. Especially good for grinding and polishing irregular shaped pieces of small and medium size—concave and convex surfaces, ornamental metal, mouldings, etc. Ball bearing idlers, roller bearing countershaft. Easy to set and to operate. Also furnished motorized.

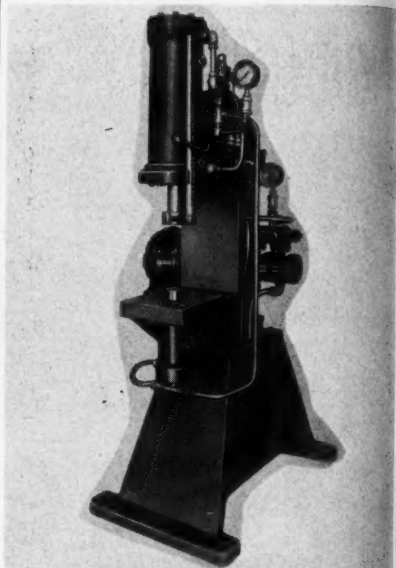
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## **"Oliver" Variety Belt Surfacer**

OLIVER MACHINERY CO.,  
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### **No. W60 Greenerd Hydraulic Assembling, Clamping and Riveting Press**

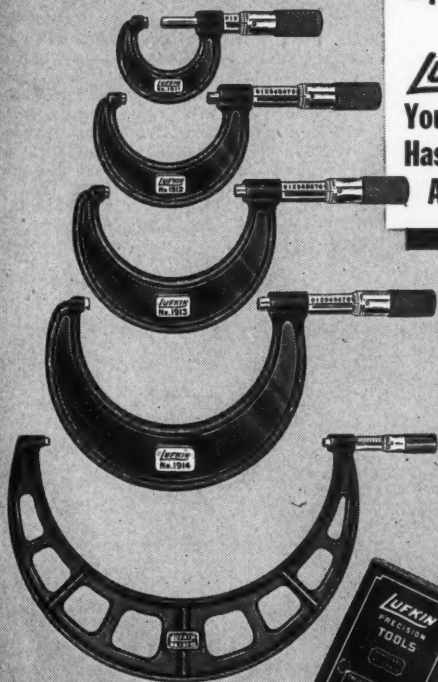
A hydraulic press with an additional ram that operates through the working table and in conjunction with the top ram has been developed by the Edwin E. Bartlett Co., Nashua, N. H. Operations of both rams are completed in one cycle. This press, to be known as the No. W60



**Greenerd W60 Hydraulic Assembling, Clamping and Riveting Press**

Greenerd Hydraulic Assembling, Clamping and Riveting Press, is shown in the illustration.

In operation, when the lever is tripped, the top ram moves downward to the work, exerting 90 per cent of the predetermined pressure—which may be set from 1½ lbs. to 10 tons. Then, instantly and automatically, the bottom ram comes into action with an upward stroke, exerting approximately one-third of the pressure exerted by the top ram. When the bottom ram reaches the work, however, the maximum pressure of both rams is instantly exerted and the pressure is maintained evenly until the lever is released. The press is equipped with a stop rod by which the length of travel

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SAGINAW, MICHIGAN, U. S. A.Canadian Factory  
WINDSOR, ONT.

of the top ram in either direction can be regulated. The top ram is provided with an automatic or manual reverse.

The press frame is of semi-steel. The hydraulic mechanism consists of a 3 h.p. motor and hydraulic pump, mounted on opposite sides of the main housing. The pump is connected between a 20 gal. sump in the base and a pair of hydraulic valves. The valves are interconnected hydraulically. The top and bottom pistons are made of steel with cast iron piston rings and sealed with chevron type packings with a bleeder pipe to take seepage. One control valve and lever operate the top piston; the bottom piston is automatic both ways. Pressure exerted by the rams is indicated on the two hydraulic gages.

The maximum pressure exerted by the top ram is 10 tons. The stroke of the top ram is adjustable from 1 to 16 in., the stroke of the bottom ram being 1½ in. Both rams are 27/16 in. diameter. The size of the table is 12x12 in. and the height of the table from the floor is approximately 34 in. Overall height of the press is approximately 78 inches.

The top ram travels 116 in. per minute on the down stroke under no load and 148 in. on the up stroke under no load. Travel of the top ram is 113 in. per minute on the down stroke with a

2 to 6 ton load and 33 in. per minute on the down stroke with a 6 to 10 ton load. Standard equipment includes 220, 440 or 550 volt, 2 or 3 phase, 50 or 60 cycle, 3 h.p. motor and control.

### Chicago Offset Riveting Machine

To meet a problem encountered by an automobile manufacturer in the riveting of the pilot bearing retainer plate to the differential housing, the machine illustrated herewith has been brought out by Chicago Rivet & Machine Company, 1846 S. 54th Ave., Chicago, Ill. To properly rivet the parts it was necessary that an offset of 4 in. be provided for. This extra offset entailed the development of a special feeding mechanism, rivet pocket with carrier and driver to force the rivet from the pocket into the assembly. Also, the stroke of the machine was established so as to allow clearance not only for the entrance of this special tooling within the differential housing, but also to permit of the necessary downward and upward travel in completing the riveting operation.

In view of the weight of the differential housing, it was desired to reduce handling to the minimum, which was made possible by a special sliding fixture employing two anvils. In operation



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HEADROOM

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### IN AN HOUR . . .

● Very frequently, the service of Union Drawn Distributors is really a life-saver. More than once, you probably have been up against it for cold drawn steel that you just had to have—"now!" The stock necessary for a job may have unexpectedly run out or perhaps some one had forgotten to requisition a certain size and shape. Anyhow, work was standing idle and customers were tearing their hair.

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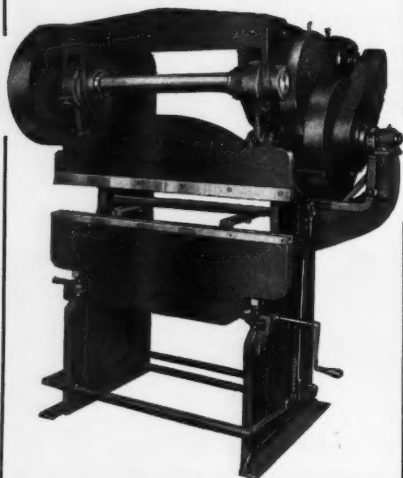


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Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities, up to 10 gauge.

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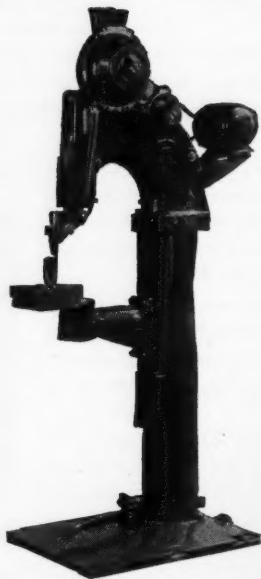
**DREIS & KRUMP MFG.  
COMPANY**

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CHICAGO

ILLINOIS

the housing is placed in position over the pilot of the anvil, together with the retainer plate. The anvil block is then moved from front to back within the fixture, bringing it into position to receive the first rivet. It is then moved crosswise to receive the second rivet and forward along the opposite side of the fixture to be finished and removed. The succeeding assembly is handled in a di-



Chicago Offset Riveting Machine

rect reversal of this procedure, or the anvil block may be traveled in a complete square as is most convenient.

The development of this machine has made possible substantial economies, produced a highly satisfactory riveting job, and provided for a high rate of production.

### No. 40 Knight Miller

The No. 40 Knight Miller, built by W. B. Knight Machinery Company, St. Louis, Mo., and illustrated herewith, is said by the manufacturer to bring to industry a universal vertical miller into which is built the maximum amount of versatility, rigidity, accuracy, and speed without sacrificing one quality for another. Incorporated throughout the design are features which make it both flexible and accurate, as well as fast and

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A MILLING MACHINE ATTACHMENT  
THAT EQUIPS ANY MILLING MA-  
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FOR SMALL END MILLS

## 6 SPEEDS - 3 RANGES

1/4 HP—450 TO 4000 R.P.M.

1/3 HP—350 TO 3200 R.P.M.

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HERE ARE THE  
SPEEDS YOU  
SHOULD HAVE  
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3/4" End-Mill—	350 R.P.M.
1/2" End-Mill—	500 R.P.M.
3/8" End-Mill—	700 R.P.M.
1/4" End-Mill—	1000 R.P.M.
1/8" End-Mill—	2000 R.P.M.
1/16" End-Mill—	4000 R.P.M.

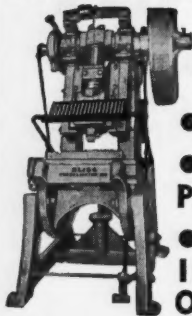


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## Junkin Safety Guards



### ASSURE:

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Safety is assured by the exclusive JUNKIN TRIPLE INTERLOCK which locks presses until guards are safe. For safety, economy and efficiency equip your presses with Junkin Safety Guards.

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## HIGH SPEED SHEARING

### Of Irregular Shapes

#### Ring and Circle Cutting



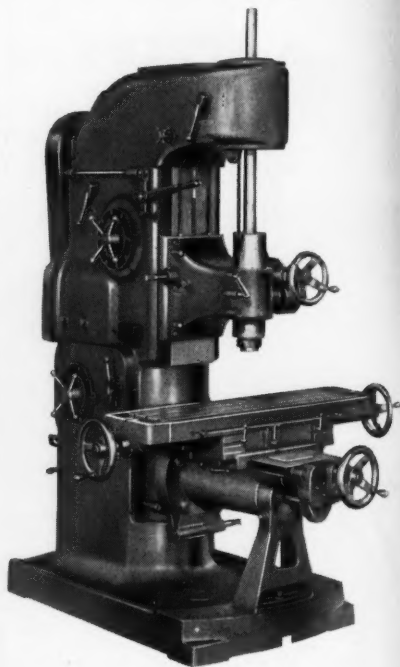
The ideal shear for sheet metal work—absolutely accurate and easily operated . . . metal is sheared and not punched . . . cut anywhere, no starting holes required for inside cutting . . . only one adjustment for various thicknesses of material used . . . material does not feed itself by action of the cutters . . . unobstructed cutting vision . . . no further finishing required. No special cutters, pilots, templates, or strippers are needed . . . long life shear blades. Standard equipment furnished for ring and circle cutting. Write for complete information.

**LIBERT MACHINE CO.**  
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rugged. The balanced design is said to make it possible to perform many operations at one setting which ordinarily would require several setups.

The column and gear-driven head are of heavily reinforced, close grain semi-steel castings, designed to provide ample bearing surfaces for supporting the other units of the machine. The knee and table unit are assembled to a large trunnion which is fitted into the lower portion of the column and which provides



No. 40 Knight Miller

for swiveling the table around the column, thereby giving additional capacity.

The gear-driven head carries the drive through a multiple disk clutch to the spindle. All shafts and gears in the head are of heat treated alloy steel and are mounted on anti-friction bearings. The main drive shaft is equipped with a brake to stop the spindle quickly.

To obtain vertical capacity, the spindle head travels on an accurately fitted slide on the face of the column, both the head and the spindle being counterbalanced by weights inside the column.

## COOPER HEWITT ENGINEERED LIGHTING

Low intrinsic brightness  
eliminates eye-strain  
... *banishes rejects*



*Combination Cooper Hewitt and Incandescent Lamps provide this machine shop with detail-revealing, restful light that helps step up production*

Give your workers cool, shadow-reducing Cooper Hewitt Mercury Light. Glareless, and unvarying in intensity throughout the 24 hours, this light aids more uniform production . . . banishes rejects. Its long light source helps operators to see down inside the hard-to-light spots on even the most complicated machines. Cooper Hewitt's yellow-green light alone is the ideal illumination where perception of detail is most important. Where color

discrimination is desirable, incandescent lamps can be added to the mercury—achieving a close approximation to daylight.

General Electric Vapor Lamp Company engineers are lighting specialists with over 30 years' experience. They will gladly discuss "engineered lighting" for every job with you . . . General Electric Vapor Lamp Company, 897 Adams Street, Hoboken, New Jersey.

**GENERAL  ELECTRIC**  
**VAPOR LAMP COMPANY**

7730

Either unit can be securely locked in any position. The spindle is of forged chrome nickel steel and is of generous proportions. It is mounted on precision preloaded grease sealed roller bearings which provide for high speeds and the maintenance of accuracy on fine work. The spindle is driven by hardened, ground and lapped spiral bevel gears.

With each machine is furnished an adapter collet with No. 12 B & S taper on the outside and No. 10 B & S taper on the inside, to correspond with the No. 12 B & S taper on the spindle. The adapter has a driver which fits into a square on the inside of the spindle nose,

and a large knurled collar which fits the thread on the outside of the spindle nose and draws the adapter into the spindle taper. This method of holding, driving and changing cutters is positive and quick. Cutters thus held will run true and will not work out.

Sixteen changes of spindle speeds are available covering a range of from 40 to 1400 r.p.m. There are four spindle feed changes ranging from 0.002 to 0.010 in. The spindle has power vertical feed in the head of 8 in. in either direction and there are 16 table feeds ranging from  $\frac{1}{16}$  to  $12\frac{3}{4}$  in. The speeds and feeds can quickly be set by revolving an easy reading dial. A feature of the machine is an automatic throw-out providing for overload. If overload occurs in the table feed in any direction, the throw-out prevents the table feeds from engaging until the overload is removed. All control levers are accessible from one position.

The table unit construction is unique in that it combines the features of tilting to either side of horizontal and at the same time swiveling around the column. These two features, used individually, effect many savings and used simultaneously increase the range of the miller. The table is tilted by the use of a large worm and gear which are easy to manipulate. The table can be positively locked when set in the desired position.

The oil reservoir is located inside the column, oil for lubricating all gears and both speed and feed units being forced from this reservoir by a pump which forces it to all the main bearings inside the machine, from which the oil cascades through the entire machine and back into the reservoir. The table unit is lubricated at three points; one at the rear of the saddle, which lubricates the knee and screws, one at the center rear, and one at the center front of the table, which lubricates the table slides. The motor compartment is located above the oil reservoir and is entirely enclosed ex-



## for Smooth Running BEARINGS

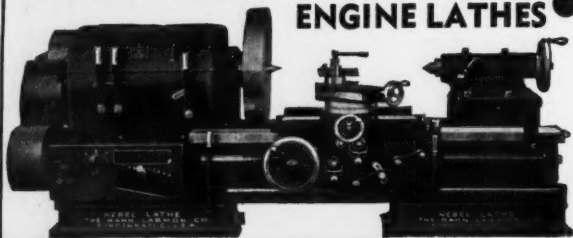
Dependable bearings are the rule with Abbott Balls in the race. Write for test samples. Surface, tolerance, structure will meet your standards—please your customers.

**THE ABBOTT BALL COMPANY**  
1056 New Britain Avenue  
Hartford, Connecticut

# ABBOTT

## BEARING BALLS

## GEARED HEAD & CONE DRIVEN ENGINE LATHES



Sizes  
16" to 36"  
Swing

A full line of Gap Lathes,  
16" to 50" swing.

Write for complete  
Information.

**THE  
RAHN-LARMON  
COMPANY**  
CINCINNATI, OHIO

cept at the rear of the machine, thus excluding dirt and oil and providing for proper ventilating and servicing.

### Cincinnati High Speed Universal Milling Attachment

A new High Speed Universal Milling Attachment, made by the Cincinnati Milling Machine Company, Cincinnati, Ohio, in sizes to fit Cincinnati L-type, MH, and Dial Type Milling Machines, is shown in the illustration. This attachment is especially useful in tool room and light production work requiring the use of small milling cutters, drills, or boring tools.

The attachment spindle may be swiveled 360 deg. in a plane parallel to the face of the machine column, and 90 deg. in a plane at right angles to the face of the column. Graduations around the circumference of the housings allow accurate setting of the cutter to any desired angle. Four clamping bolts in each swiveling element firmly hold the spindle in the position selected.

The attachment is driven directly from the machine spindle by means of a splined shaft fitting into an adapter. This adapter is driven by the arbor driving keys and centered from the spindle.



Cincinnati High Speed Universal Milling Attachment

Notice in particular the method of attaching the unit to the machine. The overarm itself, being generously proportioned to withstand deflections, constitutes the supporting element for the attachment. This construction permits the machine cross range to be 100 per cent usable; greatly exceeding the useful range generally obtained with the conventional method of clamping the at-

## RHOADS TANNATE BELTS

### ADDING TO PROFITS

Longer service life, fewer replacements, less time lost through shut-downs is a common, profitable experience of users of Rhoads Tannate Leather Belting.

From a bearing company comes the report, "When we put on a Tannate Belt we can forget the machine. Tannate Belts never give us trouble." On a grinder the belts they had used, before trying Tannate, lasted less than a year. The Tannate Belt now on the machine has been on for more than three years and "looks good as new."

Longer service life with fewer interruptions and less frequent replacements can add much to profits.

### J. E. RHOADS & SONS

PHILADELPHIA, 35 N. Sixth Street  
NEW YORK, 182 Beekman St. ATLANTA, 88 Forsyth St., S. W.  
CHICAGO, 24 N. Clinton St. CLEVELAND, 1206 W. Ninth St.  
Factory & Tannery, Wilmington, Delaware



## NEW HIGH SPEED Tapping Attachment

**FOR  
BETTER  
TAPPING**



**SMALLER  
LIGHTER  
MORE  
ACCURATE**

**WITH THE NEW  
"TRU-GRIP"**

**TAP HOLDER**

**The Finest Tapholder That Ever  
Gripped a Tap.  
Send for Details.**

**Procnier Safety Chuck Co.**  
12 SO. CLINTON CHICAGO, ILL.

tachment to the machine column. Gears and shafts are made of heat treated alloy steel. The drive is supported on anti-friction bearings throughout.

The illustrations show the complete equipment, including the quill feeding mechanism, crane, and quick change adapter for the spindle nose, which are not included with the standard attachment. Contrary to the usual practice, the quill device may be installed by the customer, if he desires to purchase this feature after having the attachment.

Specifications for the attachment are as follows:

Machine Used on	Ratio of Attach- Spindle Speeds to Machine Spindle Speeds	Attach. Spindle Speed Range
Nos. 2-L and 2-MH .....	1-2/3	40-2000
No. 2 High Speed Dial Type ...	1-2/3	35-2500
Nos. 3 and 4 High Speed Dial Type ...	1-2/3	30-2170
No. 2 Medium Speed Dial Type .....	3-1/3	65-1670
Nos. 3 and 4 Medium Speed Dial Types ...	3-1/3	60-1500

Taper in Attachment Spindle, No. 40 National Standard. Taper in Quill, No. 9 B & S. Total Quill Feed Adjustment, 2-1/4 in. Face of Column to Center of Attachment Spindle, Max., 18-15/16 in.; Min., 11-15/16 in.

## Rogers Type CC1 and CC2 Circular Knife Grinder

The illustration shows a circular knife grinder for the grinding of single or double bevel knives or disks which has been placed on the market by Samuel C. Rogers & Company, 199 Dutton Ave., Buffalo, N. Y. The grinder is available in both bench and floor types and is sturdily constructed for continuous operation with capacity for quantity production. The No. CC1 machine will grind knives to 14 in. in diameter and the No. CC2 will take knives to 20-in. diameter.

The machine is of cabinet base construction, furnished for motor drive only. Knives are revolved by a separate motor drive through a V-belt connection, providing smooth, positive knife revolution during the grinding process. The knife is mounted on an adjustable arbor with provision for solid circular knives or knives made in two sections. For thin knives or small diameters,

**Here are 3 of the  
Best Buys on the  
market, today-**

***Can you use them?***



**FIG. 1040**

The "Hallowell" All-Steel Bench Drawer can't warp or stick . . . has a cover to keep out grit and dirt . . . and a tray for small, precision tools. And it can be locked!

Clean up bench tops—put tools where they belong—install "Hallowells".

**Fig. 732—"Hallowell" Steel Work Bench**

A top that is a single, sturdy sheet of steel—on steel legs and bracing that can't loosen up, can't get wobbly! A strong, rigid, moveable work bench that will outlive a dozen wooden ones. No wonder modern shops are installing "Hallowell" Steel Work Benches—of this and similar styles.

Write for Catalog!



Pat'd and  
Pats. Pending

**FIG. 732**



**Fig. 981—"Hallowell" Foreman's Desk of Steel.** Fine to work at. Fireproof, therefore a safe place to keep records under lock and key. Get Bulletin 433.

## **STANDARD PRESSED STEEL CO.**

### **BRANCHES**

**BOSTON**

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**JENKINTOWN, PENNA.**

**BOX 556**

### **BRANCHES**

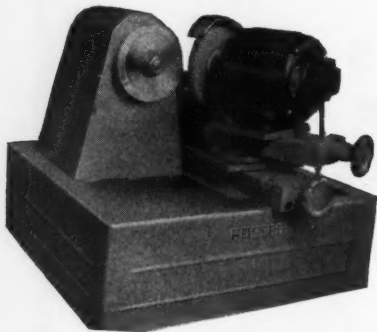
**CHICAGO**

**ST. LOUIS**

**SAN FRANCISCO**

suitable flanges are provided for supporting the knife.

The grinding wheel is 6x½ in. with a suitable guard and is mounted di-



Rogers Type CC1 and CC2 Circular Knife Grinder

rectly on the arbor of a ball bearing ¼ h.p. motor. Provision is made for eliminating end thrust and assuring smooth, precision grinding accuracy. The grinding wheel and motor assembly has

a double adjustable slide mounting to facilitate any style of grinding desired, single, bevel or double bevel. A graduated index is provided for accurate setting, and a swivel adjustment permits grinding bevels either way. The grinding head is operated in and out by hand, through a screw and hand wheel. The machine is entirely self-contained with control switches mounted on the base. Equipment includes two ¼ h.p. motors, grinding wheels, flanges, wrenches, and an emery dresser.

### Production Type 301H Double Spindle Buffer

The illustration shows the Type 301H Double Spindle Buffer which has been brought out by The Production Equipment Co., 5219 Chester Ave., Cleveland, Ohio. The buffer is designed to include two independent "motor-in-head" single extension buffers mounted on one base. Each motor is controlled by a separate magnetic starter, allowing each spindle to be run to suit the convenience of the operator.

The motor bearings are of unusually large design, giving a spindle extension diameter of 1-13/16 in. The spindles are made standard to allow a clearance

## MIDWEST-HYDRO-PIERCE-UNITS

### —PIERCING WITHOUT A PRESS—

This new method of piercing assures you of—

1. A more uniform product.
2. Saving in press and operating cost.
3. Reduction of assembly cost.
4. 75% salvageable for next year.
5. Costs comparable with die costs.
6. Elimination of costly cam dies.

The illustration shows a radiator shell, with all reinforcements welded in place, being completely pierced with nineteen Hydro-Pierce units, each bearing one or more punches, and driven by a power-plant suspended under the ceiling out of the way.

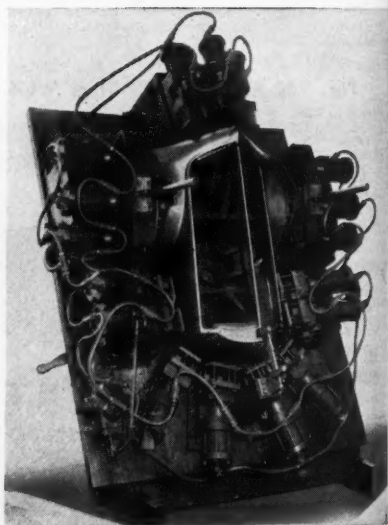
### Get All The Holes In One Shot

Also suitable for short trimming and forming operations.

Write for complete details.

**THE MIDWEST PRODUCTION  
ENG. CO., INC.**

1010 Hofmann Bldg., Detroit, Mich.

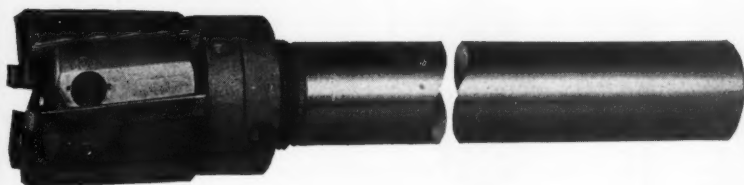


# Life Insurance

is fundamentally protection against the unknown future.

Grinding life in any tool is your protection against high tool costs.

**Do your reamers offer the maximum protection?**



**G & G**

## CAM LOCK REAMERS

offer the maximum life obtainable, from 3/16" on the smaller sizes to 5/8" on the larger, and this is on the **diameter** where you want it.

**THINK IT OVER**

**Goddard & Goddard Co.**

**DETROIT, MICH.**

***"Red Shield"***  
**HIGH SPEED**  
**DRILLS**  
 —and a complete line  
 of Tools You Can  
 Trust



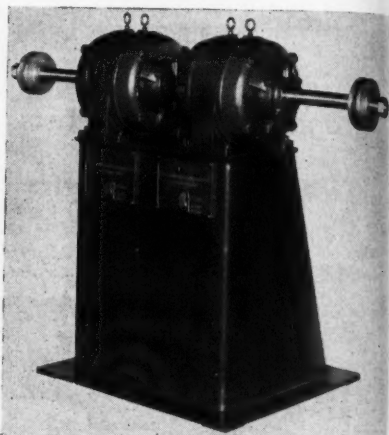
**THE STANDARD TOOL CO.**  
 CLEVELAND, OHIO

New York

Detroit

Chicago

of 13 in. between the side of the base and the inside of the wheel. The motors supplied on Type 301H are of semi-enclosed construction, allowing the use of smaller frames, and similar designs using totally enclosed motors are also available. The rating of each motor ranges from 4 to 10 h.p. Spindles speed for 60 cycle service are either 1800 or



Production Type 301H Double Spindle Buffer

3600, and when such speeds meet operating requirements, this double spindle motor-in-head construction is definitely economical.

### Hobart Series MN Current-Saving Model Arc Welder

The Hobart Brothers Co., Troy, Ohio, has brought out the Series MN "Simplified" Arc Welder which, in addition to an improved type of wheel mounting with low center of gravity, is equipped with what is termed as "Selective Motor HP Control." The manufacturer states that only one-third of the usual starting current is required in the operation of this welder, and that the power factor of the machine and its efficiency are materially improved. It is possible to use the equivalent of a motor of one-half the horsepower rating for welding in ranges up to one-half or two-thirds of the rated capacity of the generator. The manufacturer's announcement claims that the results are as follows: (1) welding current costs are cut 30 per cent to 50 per cent in average work, (2) power company penalties due to

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STA

poor power factor of equipment are avoided, (3) expensive rewiring is eliminated, and (4) idling and light load power losses are cut in half. Power factor of the equipment is improved in the light load ranges so that it is 90 per cent or better in all practical welding ranges.

The operation of the "Selective Motor HP Control" is accomplished by the use of but one hand. A convenient latch locks the handle in the "Low" position, where only half the rated horsepower is used for starting and for welding up to one-half the rated generator capacity in continuous manual arc welding or up to two-thirds of the rated capacity for intermittent welding. When it is desired to operate at higher rates, a convenient lever releases the handle so that it may easily be turned to the "High" position, where the full rated horsepower of the motor is available for full load welding. It is also possible, when so desired, to start and weld in the "High" position without turning the handle to the low setting.

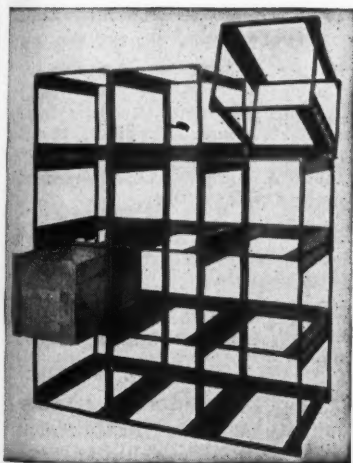
The Series MN Current-Saving Model is available in 75 amperes,  $1\frac{1}{2}$  to 3 h.p.; 100 amperes,  $2\frac{1}{2}$  to 5 h.p.; 150 amperes, 5 to 10 h.p.; 200 amperes,  $7\frac{1}{2}$  to 15 h.p.; 300 amperes, 10 to 20 h.p.; 400 amperes,

$12\frac{1}{2}$  to 25 h.p., and 600 amperes, 20 to 40 h.p. It is pointed out that the Hobart model rated at 150 amperes in both the MK and MN series is a full 6 KW



Hobart Series MN Current-Saving Model Arc Welder

machine, being conservatively rated 150 amperes at 40 volts. All Hobart machines in both series are also built in standard horizontal position to operate at 1750 r.p.m., embodying the same prin-



## ANY BOX in the PILE

*Instantly Available  
in the "STACKRACK"*

The welded steel STACKRACKS allow you to pile shop boxes or tote pans ceiling high, still remove any box without disturbing the others.

Designed to lock together as a unit, STACKRACKS can be used under benches, behind machines, in odd corners. Build an auxiliary stockroom anywhere. Count the low cost against the time and labor saved and you'll agree that a STACKRACK installation will lower your production cost.

## FLEXIBLE STOCKROOM with STACKBINS

Sturdy Steel "STACKBINS" or STACKBIN Sections may be used as individual receptacles or stacked in tiers to form complete stock cases of any length and height. Seven sizes. Use the coupon.

*A STACKBIN is made for your boxes or pans. Send the coupon today.*

## Coupon Brings Whole Story

**STACKBIN CORP.**



*"Stacked and  
still accessible"*

PROVIDENCE, R. I.

Stackbin Corp., 54 Troy St., Providence, R. I.

Without obligation, send me literature.....on STACK-  
RACKS.....on STACKBINS.....prices on STACK-  
RACKS to hold boxes.....(give dimensions).

Name .....

Firm .....

Address .....

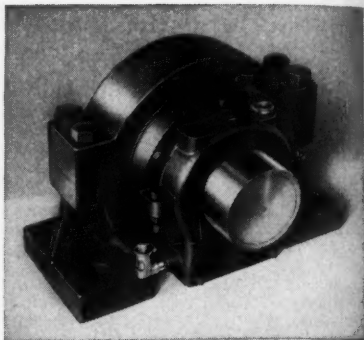
ciples and the same equipment features regardless of size.

### Ball Bearing Takes Thrust Loads In Fafnir Roller Bearing Pillow Block

A special roller-bearing pillow block for service involving heavy end thrust in addition to the radial load is now being produced by the Fafnir Bearing Company, New Britain, Conn. In the new pillow block, a separate heavy-duty ball bearing to take the thrust loads is included as an integral part of the assembly. The design is said to be definitely superior in capacity and service life to that in which bronze plate thrust carriers are used.

Arrangement of the bearings is such that the entire radial load is taken by the roller-bearing, while all the forces tending to displace the shaft axially are borne by the ball-bearing. A spherical housing construction which provides self-alignment, similar to that used in other Fafnir roller-bearing pillow blocks, is also a feature of the design.

The housing is of the two part type, which simplifies assembly. It is oil-tight and equipped with a levelling device for oil lubrication. The roller bear-

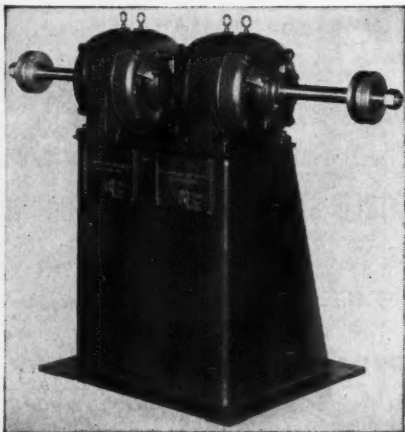


Fafnir Roller Bearing Pillow Block

ing itself is of the special type recently developed in which an increased number of solid rolls are incorporated, thus giving the greatest possible load capacity. The cage is also said to be of unusually sturdy construction.

These pillow blocks are now available for shaft sizes ranging from 3-5/16 to 10 inches, and with radial load capacities up to 250 tons.

## GRINDERS and BUFFERS



● An unusually complete line from 1/2 to 20 HP. Bench, Pedestal, Standard & Special Widths, Combination Grinders & Buffers, Disc Grinders, Normal or Heavy Duty.

Built in "Motor in Head" or Selective Speed Designs. Self Contained Exhausters available.

A line designed to allow you to select the least investment for each application.

We also manufacture a complete line for the motorization of cone pulley machines.

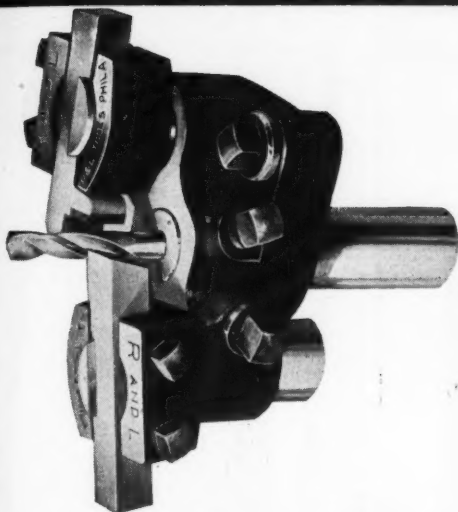
Quotations submitted promptly.

## THE PRODUCTION EQUIPMENT CO.

5219 CHESTER AVE.

CLEVELAND, OHIO

# SEVEN TOOLS IN ONE . . . :



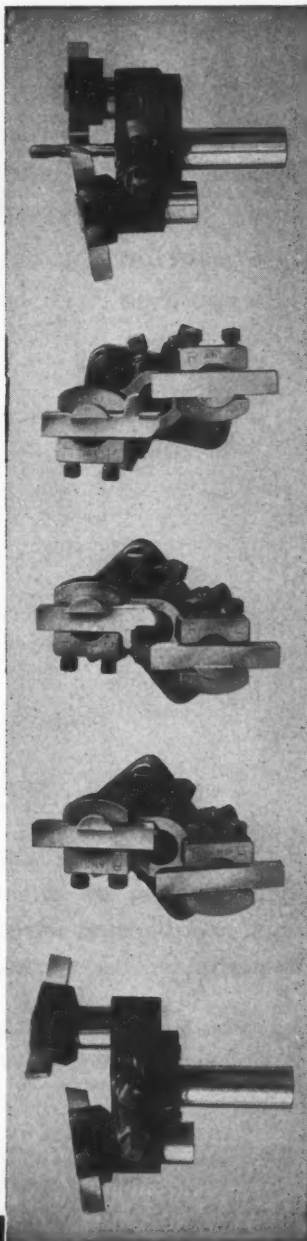
## with the **R & L** TOOL

In the new R & L Turning Tool is a combination of seven tools. A real opportunity for increasing production, decreasing costs and producing better work with a tool that will save you over \$200.00 when originally purchased.

R & L Tools make former turning methods obsolete and extravagant on a wide variety of small and medium sized work. Investigate all money saving possibilities—write for folder.

### R & L TOOLS

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If your automatics are equipped with Sutton **DIAMOND GRIP** Collets, you have less chucking strain, less wear on the collet and less spoilage . . . .



Because all Sutton **DIAMOND-GRIP** Collets are diamond serrated and diamond serrations grip tighter under less tension.

You can have them in single-piece, master, or compensating types for all leading makes of machines.

WRITE FOR COMPLETE CATALOG  
**SUTTON TOOL COMPANY**  
 2838 W. Grand Blvd., Detroit, Mich.

### Tanner Anti-Freeze for Air Lines

The freezing of moisture in shop air lines and air tools can be absolutely eliminated by the use of the Tanner Tank air line anti-freeze system, according to the manufacturer—Sullivan Machinery Company, Michigan City, Ind. The system is said to be harmless, odorless and non-explosive. It will not injure metal, hose, or lubricants. Tanner Tanks are built of welded construction



Tanner Tank Anti-Freeze System

to A.S.M.E. specifications for 200 lbs. working pressure, and are easily installed. This system is guaranteed to protect air lines and air tools against freezing to a temperature of 70 deg. below zero.

### Landis Taper Cutting Die Head

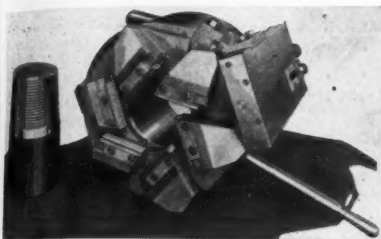
A special heavy duty Taper Cutting Die Head for handling threads of large diameters, steep tapers, and extra lengths, has been added to the line of die heads manufactured by the Landis Machine Company, Waynesboro, Pa. Known as a Special 6-In. Landmatic, it augments the line of Landmatic die heads with taper attachment previously manufactured in

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**Landis Taper Cutting Die Head**

sizes up to 4-in. The head is of the six-chaser type and was designed for threading parts used in the oil industry, such as tool joints, drill stems, and so on.

This head is a stationary type head adapted for use on a heavy duty turret lathe. An adjustable bar, mounted on some stationary part of the machine, retards the cam carrier as the head advances onto the work. The adjustable bar is set to have contact with the cam carrier just as the part to be threaded enters the die. The sliding movement of the cam, along the cam shoe allows the chasers to recede at a uniform rate and produces a tapered thread corresponding

to the taper of the cam. The head opens automatically when the cam trips off the end of the cam shoe.

Before the head is closed, the carriage must be returned a sufficient distance, to clear the stop bar. The adjustment for thread length limits the forward travel of the cam carrier and insures threads of uniform diameter and length.

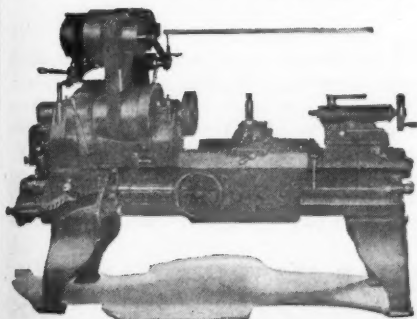
The head can be supplied for cutting various diameters, tapers, and thread lengths. It was primarily designed for cutting 6-in. O.D. thread, 4 pitch, 2-in. taper per foot, and 5-in. length of thread. The same head can also be adapted for cutting 5½-in. O.D. thread, 4 pitch, 3-in. taper per foot, 4¾ in. long and 4¾-in. O.D. thread, 4 pitch, 3-in. taper per foot and 4 in. long thread.

### Geometric Redesigned Style C Self-Opening Die Heads

The Geometric Tool Company, New Haven, Conn., has redesigned their Style C line of self-opening die heads and in so doing has made it possible to convert one whole series of threading tools from an inside trip die head to an outside trip type tool, or vice versa. This conversion can easily be made through the application of two or three inexpensive

## MODERNIZE . . .

. . . your Lathes, Milling Machines, Shapers and other cone pulley Machines with Cullman Individual Drives.

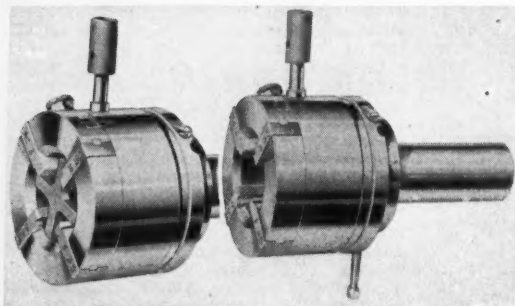


Made in sizes for motors ½ to 7½ H. P. Sold subject to your approval.

Send for information

**CULLMAN WHEEL Co.**

1336 Altgeld St.  
CHICAGO, ILLINOIS



Geometric Style C Self-Opening Die Head. (Left) Head equipped with inside trip. (Right) Head equipped with outside lever trip

parts. Thus the two tools shown here are exactly the same tool, in the one case the head being equipped with a inside trip and in the other case with an outside lever trip.

An inside trip is recommended on work which is so irregular in shape that it is impossible to chuck it uniformly, yet where it is desired to maintain a uniform thread length. The outside trip head, on the other hand, is employed in

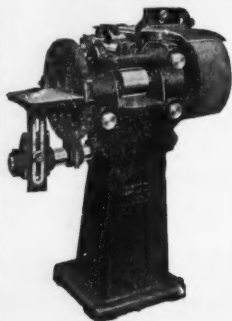
cutting fine pitch threads or short lengths where it is desirable to relieve the chasers and the thread of all stress in the tripping action.

The tools are of alloy steel, hardened and ground. Working parts are held to precise limits, thus assuring the users of close threading tolerances. The line includes the Style C Pull-Off Trip Die Head, which was also redesigned, thus forming a complete line of Style C Die Heads in three distinct types. Twenty-three sizes and types of Style C heads are available with a cutting range from  $\frac{1}{8}$  in. to 6 in. Other sizes and types in a diameter range up to 10 in. are available on special order.

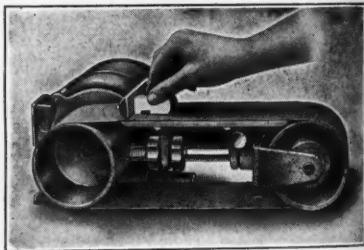
### Yankee Vise and Vise Clamp

North Bros. Mfg. Co., Dept. MS, Philadelphia, Pa., is now marketing a machine vise so designed that it can be used with a vise clamp which greatly increases the utility of the vise. The vise clamp can be attached to a machine

## SPEED UP POLISHING SURFACING GRINDING



TYPE "R"



... with these two "PRODUCTION" machines. THE HANDY SPEED FINISHER, shown above, is unequalled for finishing small castings, removing burrs, straightening and finishing dies—produces finer finished work—adjustments made by hand. At the left is the Type R, providing a combination of Surface and Disc Grinding, Polishing, Surfacing, Burring, Buffing, etc. all on ONE machine. The number of jobs adaptable to this machine will surprise you. Write for complete details and prices.

**PRODUCTION MACHINE COMPANY**  
GREENFIELD MASS.

# THIEL MODERN TOOL-ROOM MACHINERY

Ask

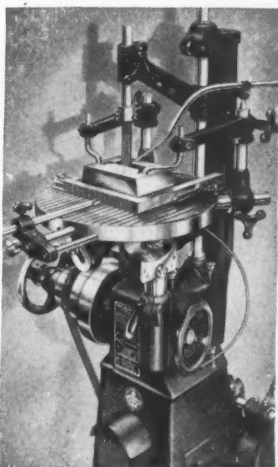
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Catalogs

## THIEL PRECISION SAWING AND FILING MACHINE

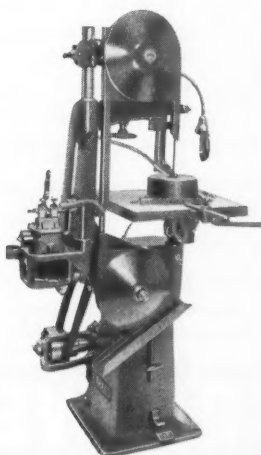
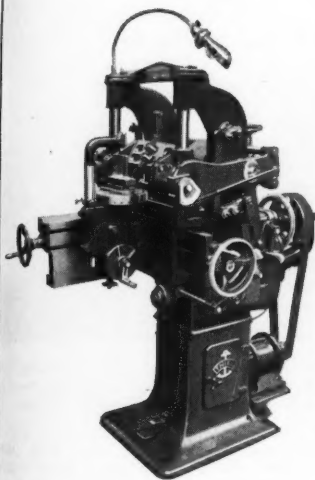
The **only** Universal Machine for **Saw-  
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Die and Tool Work.



## THIEL VERTICAL PUNCH & FORM-SHAPER

The **New** method  
to cut **Pedestal**  
Punches out of  
the **Solid**; produc-  
ing faster and more  
accurate punches,  
with clean and cor-  
rect profiles, even  
on intricate con-  
tours.

Range of Files:  
1/32" to 3/4" Style.  
Many Different Shapes.



Ask

to

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them.

## THIEL HIGH SPEED PRECISION BANDSAW

Equipped with **automatic** and **universal**  
self-centering Feed. A Quality Band-  
saw for inside and outside work.

**MARBURG BROS. Inc., 90 West St., New York**

## Lengthening the life of the toolroom dollar

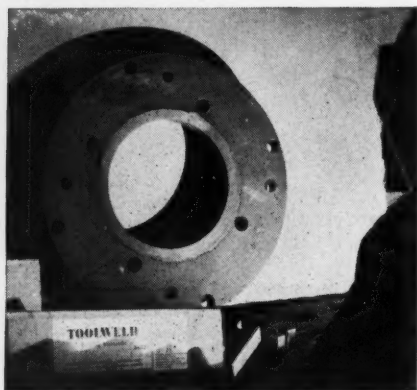


Photo courtesy of Whitehead & Kales, Detroit, Mich.

### BY TOOLWELDING THEIR DIES THEY SAVE 50%

• The blanking die shown here was cut from mild steel plate, given a build-up of "Toolweld," finished off smooth and then welded to the base. It is typical of many on which the user is saving 50% over the usual tool-steel construction methods. After 600 operations on 12-gauge steel, this die is still as good as new.

Find out how you can cut toolroom costs with this new welding electrode development! Address

**THE LINCOLN ELECTRIC COMPANY**  
Dept. E-331, Cleveland, Ohio

Largest Manufacturers of Arc Welding Equipment in the World

# TOOLWELD

Cuts the cost of building and maintaining tools and dies

table in such manner that work clamped in the vise can be instantly adjusted for drilling and then moved out from under the spindle for hand tapping or other hand operations. The illustration shows the Yankee vise removed from its swivel base, which can be seen in the background attached to the bench, and slipped into position on the vise clamp, which is attached to the drill press table. There the holes in the work have been drilled and the vise has been swung into convenient position for tapping.

The Yankee vise is made in four sizes, with or without swivel base. When



The Yankee Vise has been removed from the swivel base on the bench and securely attached to the face plate with a Yankee Clamp.

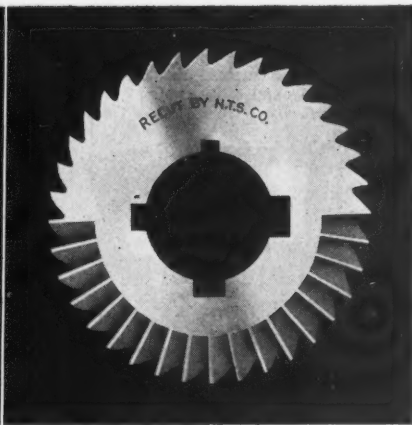
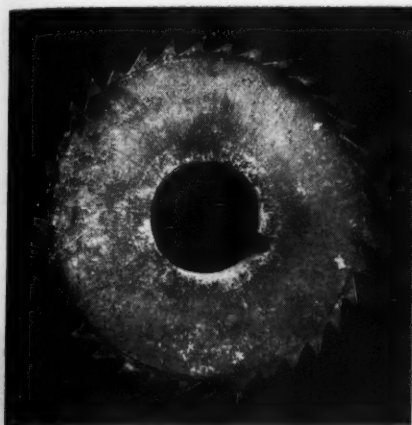
used with the swivel base, the vise can be detached quickly, holding the work in original alignment for continuous machine or hand operations. The sides, bottoms and ends of the vise are accurately machined, and the vise may be used either on the side, end, or base.

The vise jaws are faced with hardened steel plates. The sliding jaw has a broad seat, clamps evenly top and bottom, and does not spring. A hardened steel plate with V-shaped grooves holds round stock or irregular shapes. The screw is of steel with a fine pitch Acme square thread. The swivel base can be locked in any position.

The Yankee vise clamp increases the utility of the Yankee vise. The clamp holds the vise with the work rigidly for drilling or other machining, making the machine operations easier and assuring accuracy.

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### Service Compound Dump Truck

A truck especially designed for handling metal shavings in the machine shop, illustrated herewith, has been brought out by The Service Caster and



Service Compound Dump Truck

Truck Co., 596 N. Albion St., Albion, Mich. The overall height of the truck is 35 in. The hopper is made with capacities of  $6\frac{1}{2}$ ,  $7\frac{3}{4}$ , 9,  $10\frac{1}{4}$  and  $11\frac{1}{2}$  cu. ft. For trucks of the first three capacities the length is 48 in.; the overall length of the  $10\frac{1}{4}$  cu. ft. truck is 54 in. and that of the  $11\frac{1}{2}$  cu. ft. truck is 60 in. The running gear consists of two  $12 \times 2\frac{1}{2}$ -in. rigid wheels with 1x3-in. Hyatt Bearings and two 6-in. Hyatt Bearing Service casters. Every part of

the truck is of substantial construction and is designed to withstand hard wear for an indefinite period.

### L-R Flexible Couplings

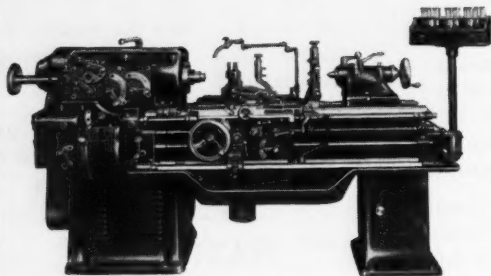
Lovejoy Tool Works, 5007 West Lake Street, Chicago, announce the Type WF coupling, which is made with one of the bodies in the form of a flange which bolts onto the flywheel or a clutch or brake drum of a Diesel, gas or steam engine.

The flange-body design reduces the overall length of this coupling by one-third. A recently installed WFR-800 coupling, capable of carrying a load of 324,000 inch pounds, extends less than 6 inches beyond the rim of the flywheel. It is apparent that this saving of space at an important point, allowing many more inches for frame and other parts, must add considerably to the efficiency and life of both drive and driven unit. The L-R Type WF Flexible Coupling will be made in sizes from 3 in. to 14 in. bores, suitable for 2500 h.p. at 100 r.p.m.

As on the well-known L-R Type W, free floating load cushions are held in place by a quickly removable outside retaining spring. This permits larger

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Leading shops throughout the country are saving many dollars and hours on scraping with dependable, efficient **ANDERSON POWER SCRAPERS**.

Important features: **PORTABILITY**—can be easily moved about and made ready for use at any light socket. **FLEXIBILITY**—Smooth, steady stroke. Scraper can be adjusted simply and quickly from a fraction of an inch to a 4½ ft. stroke. **EASE OF CONTROL**—Operation of the scraper ram is as natural as using a hand scraping tool. Machine is extremely

sensitive and responsive. **BLADE GRINDER**—Conveniently mounted on pedestal enabling operator to constantly keep the blade sharp without leaving the work. **AUTOMATIC SAFETY CONTROL**—shuts off current when motor is unduly overloaded.

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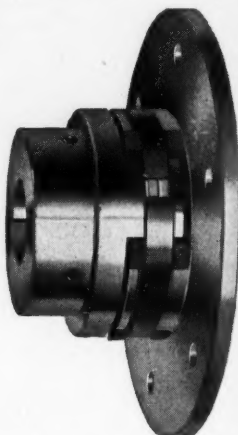
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hubs and greater load carrying surfaces with consequently increased carrying capacity. The load cushions are always in plain sight and can be removed and replaced in a few minutes without tearing down the coupling. This principle has been thoroughly tested in seven years of service.

Three types of resilient cushioning material are available for each of these couplings: (1) Metalflex—a high grade, long wearing brake lining material, used for heavy shock loads as on excavating machinery, steel mill equipment and



**LR Type WF Flexible Coupling**

other machines exposed to extreme weather conditions; (2) Leather Load Cushions—of best oak tanned belting leather, for use on sustained loads and greater misalignment; (3) Multiflex Cushions—a rubber duck fabric, vulcanized under high pressure, for use on fluctuating loads and where high resilience is required. By application of suitable materials and design, capacities may be increased without change in overall dimensions.

### Electro Lift Worm Drive Hoist

A high speed worm drive electric hoist illustrated herewith, has been placed on the market by Electro Lift, Inc., 30 Church St., New York, N. Y. The hoist has a hoisting speed of 60 ft. per minute and is built in sizes of 250 and 500 lbs. The hoist is particularly adapted for rapid handling of small loads and volume production, such as lowering engine

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Capitalize Lyon Box advantages in your shop. They provide maximum storage per square foot of floor space . . . cut repair bills to a minimum . . . out-wear reinforced (iron-bound) wood containers a dozen times . . . help speed up production. Available in many combinations of designs and sizes.

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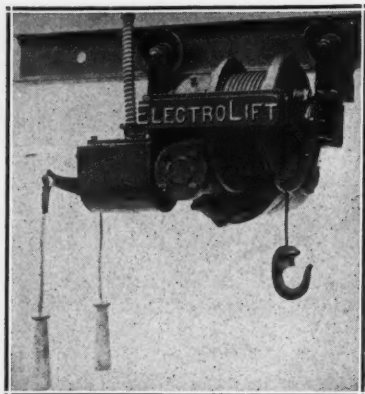
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Close headroom is the feature of this Electro Lift Worm Drive Hoist

radiators and other units into the automobile chassis, for serving conveyor lines, and so on. It is also especially adaptable for use with pickling and dipping tanks and wherever high speed is essential.

The hoist has a worm drive with the

worm and wheel running in Timken tapered roller bearings, fully enclosed within the gear case and operating in a bath of oil. This design provides for simple construction and quiet operation. The motor is equipped with ball bearings and is directly attached to the hoist frame, making a very compact arrangement. A special feature of the hoist is the unusually close headroom between the hook and overhead track. Control may be of the rope type or push button type, the latter giving accurate control of the load by "jogging."

The frame carrying the entire hoisting mechanism and drum is a one-piece steel casting of great strength and rigidity. The hoist is perfectly balanced at all loads and the load hook is directly under the track, eliminating any tipping. The hoisting drum is of large diameter and has large flanges to carry a single layer of cable without over-lapping. The maximum amount of lift is 15 feet.

### Lansing Bar Iron Truck

A truck especially designed for the transportation of bar iron, pipes, angles and similar long unwieldy material has been placed on the market by the Lansing Company, Lansing, Mich. The truck

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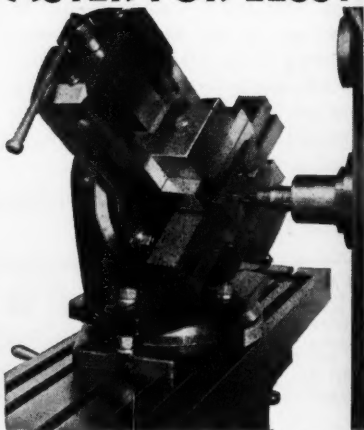
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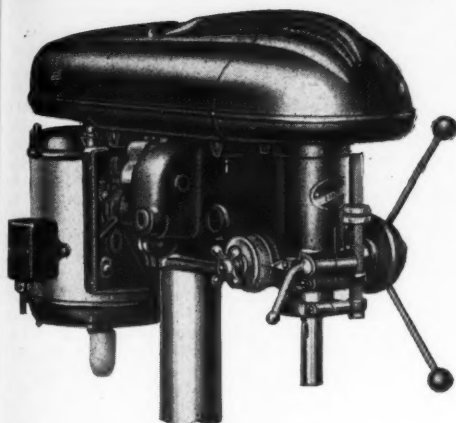
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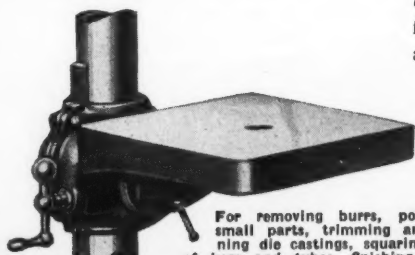
# A Modern Drill Press



## New 17-in. Delta Model

Here's the greatest drill press value in years! Check the many unusual features of this new 17 inch Delta Drill Press. Note its low price. Bring your shop up to date with this efficient tool.

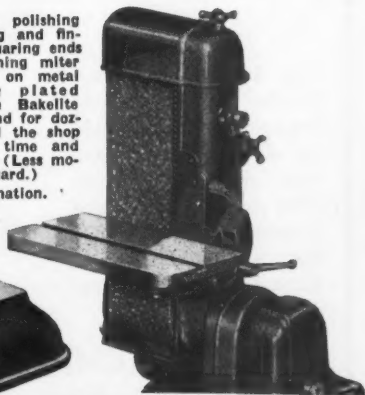
Five speeds: (385, 600, 935, 1450, 2240 R.P.M.) Floating Drive: Pre-loaded double-seal ball bearings; 16-tooth splined spindle; Table-Raising gear; Head-raising gear; Tilting or production table; Completely enclosed belt; Safety spring wind; Foot power feed. Separate drill press heads available. Write for name of nearest Delta dealer and complete descriptive literature.



## New 6-inch Belt Surfacacer

For removing burrs, polishing small parts, trimming and finishing die castings, squaring ends of bars and tubes, finishing mill and other angular cuts on metal mouldings, satin-finishing plated parts, removing flash on Bakelite and other plastic parts and for dozens of other uses around the shop this machine will save time and money. **ONLY \$28.85.** (Less motor, stand, pulley and guard.)

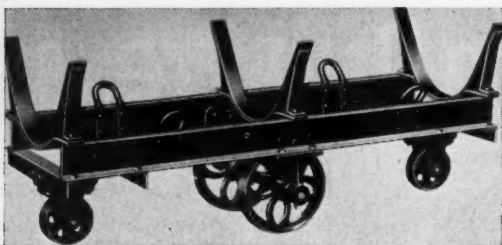
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With motor pulley  
and belt, but  
without  
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**DELTA MFG. CO.**

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Lansing Bar Iron Truck

frame is built of 4-in. channel iron. As shown in the illustration, the truck rides on two sturdy 14-in. wheels at the center and 8-in. casters at each end. It is equipped with three heavy, well-built cradles which are strongly reinforced to the frame to hold the load.

Inasmuch as the wheels are equipped with Hyatt roller bearings, the truck is easy to handle even with a full load. The truck is made in capacities up to five tons.

### Ne-Ver-Rust Corrosion Preventative

Metal surfaces of all kinds can be definitely protected against rust by the

use of a thin, transparent liquid known as "Ne-Ver-Rust", according to the manufacturer, The Never Rust Manufacturing Co., 103 Lafayette St., New York, N. Y. When applied to metal surfaces, Ne-Ver-Rust is said to produce a transparent, non-porous film coating, absolutely impervious to dampness, elements or chemical actions.

A gallon of Ne-Ver-Rust is said to cover between 1500 and 2000 sq. ft. on a polished surface. This coating is sufficient to preserve the surface of the

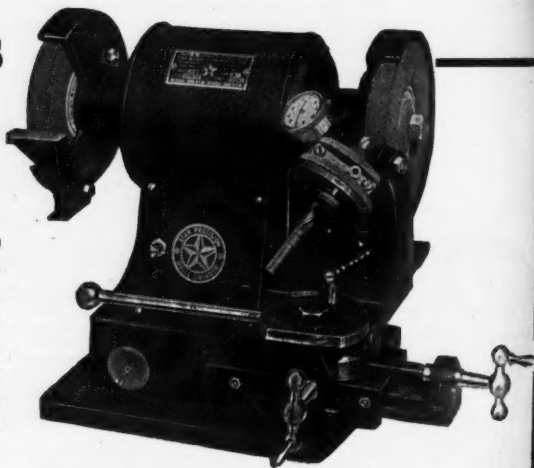
metal under any conditions and can be readily removed when desired without undue labor. Ne-Ver-Rust is said to contain no ingredients that might be injurious to highly polished surfaces, and can be safely used on engraved plates or the most delicate machinery.

Although adhering with the utmost tenacity, the manufacturer states that Ne-Ver-Rust can readily be removed by wiping with kerosene, benzine or other dissolvent. Ne-Ver-Rust requires no pre-heating and may be used as a dip or applied with a brush. Although it will set sufficiently to enable of ordinary handling after a couple of hours after application, it does not harden like

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No. 31 to 1/2"

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.



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# DRIVING POWER



Driving power of a chuck?

Yes — motors, transmis-  
sions, bearings — all the  
things that mean power  
to a drilling machine, a  
lathe, a portable drill are useless, might just as well be  
non-existent, without the chuck to take all that power,  
connect it to a tool and drive it into the work.

There are two main reasons why Jacobs Chucks are the  
standard of all comparison—absolute reliability of qual-  
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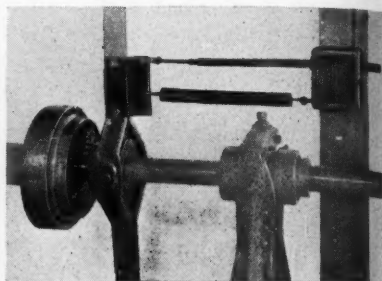
**THE JACOBS MANUFACTURING COMPANY**  
HARTFORD CONNECTICUT, U. S. A.

paint. Ne-Ver-Rust is available in 1, 5 and 10-gal. cans, also in steel barrels.

### Hilliard Remote Control Clutch Release

The Hilliard Remote Control Clutch Release, designed for use with the Hilliard Friction Clutch, which is a product of the Hilliard Corporation, Elmira, N. Y., permits instant disengagement of a mechanical drive by the simple act of pressing a push button placed near the drive or at a distant point. Any number of push buttons may be used so that the machine may be stopped instantly from any of a number of locations. The clutch is engaged manually by means of the usual lever.

The use of the clutch release makes it possible to instantly destroy the inertia of a motor and thus prevent over-run, or to disengage separate units instantly. Whereas in many cases special motors and magnetic clutches are used to accomplish these results, the Hilliard Remote Control Clutch Release is said to be effective through the use of a comparatively simple mechanism. By installing a Hilliard Clutch with a remote control release between the motor and



Hilliard Remote Control Clutch Release

the machine, it is said that the machine can be stopped instantly from any location without stopping the motor and more quickly than if the motor armature is left connected with the machine. The installation of the clutch release is comparatively simple; the clutch is mounted on the shaft and the release box is fastened to a support at a given distance away. When it is desired to stop the machine, a push button is pressed which causes the electric current to operate the release mechanism. As soon as the release mechanism operates



## DO-ALL

The new Internal and External Contour Saw made the part illustrated in the exceptional time noted.

This is only an example of the astonishing savings from the new cutting process that saws, files, polishes.

Find out how the DO-ALL CONTOUR method can speed up your production as it has in Aircraft, Auto, Electric, other Industries, through its controlled mastery of metal.

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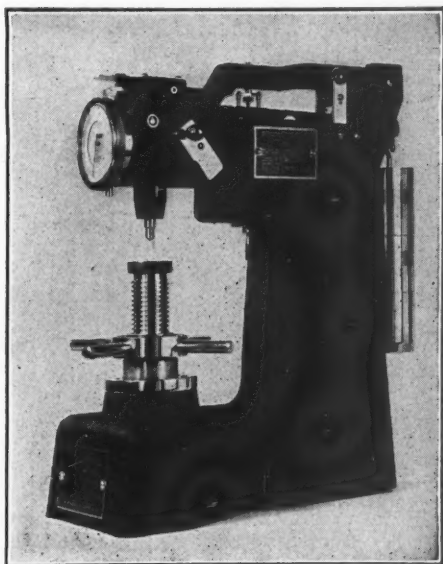


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The answer is a difference  
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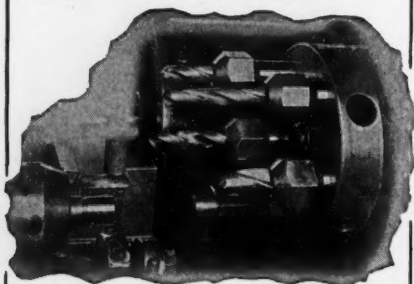
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Automatic Screw Machine, holding Drill - Counter-bore - Center Drill and Reamer in UNIVERSAL COLLET CHUCK

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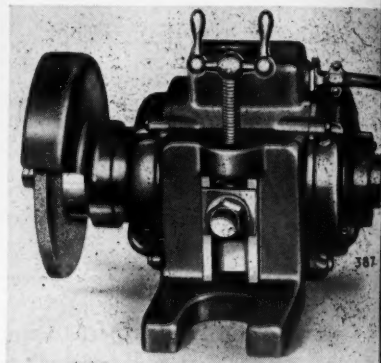
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ENGINEERING CO.**  
FRANKENMUTH, MICH.

it opens its own circuit; thus the amount of current required to operate the release mechanism is negligible. Absolute protection is said to be provided against arcing and the burning of small automatic contacts.

## Hisey Motor Driven Angle Plate Grinder

The illustration shows a motor driven angle plate grinder which has been brought out by The Hisey-Wolf Machine Co., Cincinnati, Ohio. The grinder is designed to be attached to the tool post of a lathe, the vise of a milling machine



Hisey Motor Driven Angle Plate Grinder

or the head of a shaper, planer, boring mill or other machine tool. The grinder is intended for long wear under hard usage; thus the spindle is unusually heavy and the wheel arbors are exceptionally large. The spindle is mounted in precision ball bearings which are seated in accurately ground housings.

The grinder is powered by a commutating type repulsion induction motor designed for single phase service. Double lock nuts throughout permit the operation of the grinder in either direction of rotation with safety. The grinder is made in six sizes from  $\frac{1}{4}$  to 5 hp capacity.

## Signal Light-Duty $\frac{1}{4}$ -In. Portable Electric Drill

Designed for intermittent service this new light duty  $\frac{1}{4}$ -in. portable electric drill is announced by Signal Electric Mfg. Co., Menominee, Mich., as an addition to their line of portable electric

**COST LESS TO PRODUCE**



**HY-TEN**

## ALLOY STEELS

The free machining qualities and excellent physical properties found in HY-TEN and ECONOMO steels greatly facilitate production on important special parts reducing costs and insuring finer finished products.

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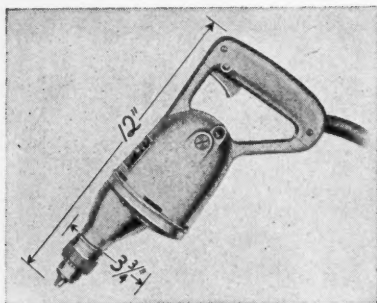
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Write for free copy of Steel User's Data Sheets, containing valuable information on use and treatment of steel.

drills. Designated OB-8, it is a high-quality product, properly balanced, with an air-cooled handle having a comforta-



**Signal Light-Duty 1/4-In. Portable Electric Drill**

ble grip; trigger type switch in the handle with lock for continuous operation. It is powered by a Signal Universal motor for D. C. or A. C. 110-120 volts, 25-60 cycles, and is low enough in price that all shops can afford to have a number for use. As noted on the illustration, the Type OB-8 Drill is

12 in. long and 3 3/4 in. wide.

The shipping weight is 7 lbs. Equipped with 8 feet of heavy-duty, rubber-covered cord with rubber cord protector and a rubber plug; Almond 3-jaw chuck with key. The housing is durable aluminum alloy; bronze bearings, wool packed, with thrust ball bearings on spindle shaft. The gears are special alloy heat treated. Brushes are accessible from the outside. The speed is no load 2950 r.p.m. This light duty drill is especially adaptable for radio repair work, wood and metal assembly, airplane construction and repairs, boat building, and kindred applications.

### Universal Pneumatic Die Cushion

An improved design in a combination drawing and stripping die cushion is now being marketed by the Dayton Rogers Manufacturing Company, 1845 E. Franklin St., Minneapolis, Minnesota. The basic design of this device is a heavy cast iron alloy cylinder that may be clamped directly to the press bolster plate for shallow drawing purposes. It may also be placed with the use of spacing studs clear of the bolster plate for compound blanking purposes. The long piston, having a hardened and ground



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Plain	Helical	Side
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**Midwest Tool & Mfg. Co.**  
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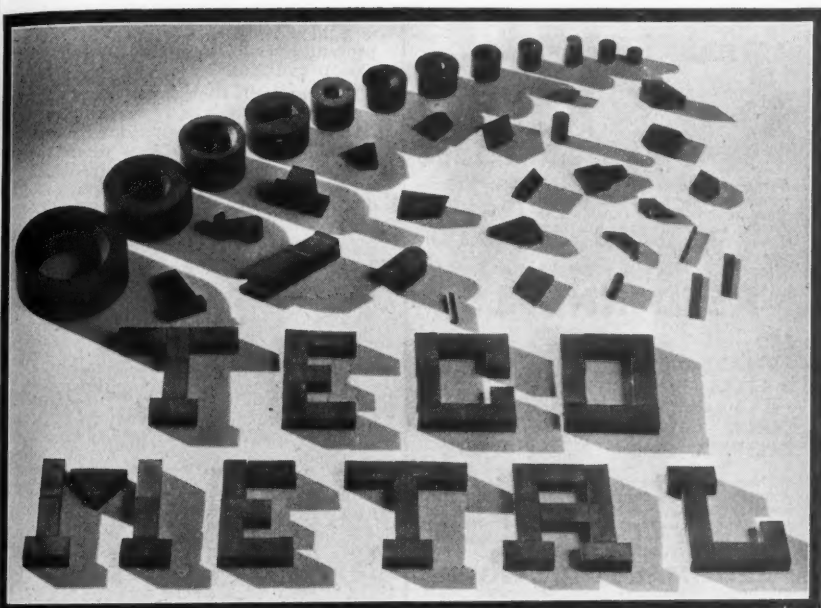
Expertly designed to cut freely, eliminate chatter, and provide ample chip clearance. Send for Catalog 14-M showing Midwest's complete line of Milling Cutters and End Cutting Tools.



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## A GRADE and SHAPE *for every purpose*

**WHEREVER** the job is tough, you'll find it advantageous to apply TECO refractory carbide compositions. The superior wearing qualities and ability to take rough usage enable these hard alloys to do the job better—faster—at more profit to you.

And remember, there's a grade and shape for every purpose.

Write today for catalog and revised price list.

Typical TECO tungsten carbide cost cutting applications are found in wearing parts of all types, lathe centers, tipped counterbores, drills, reamers, milling cutters, and general tipped tools of all types.

Put TECO tungsten carbide to work in your plant—you'll find it pays—and pays well.

### **SUPER TOOL COMPANY**

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## REED MICROMETERS

Extremely Accurate and Serviceable. Manufactured under same management for 30 years. Made in 1" to 6" Outside and 1/4" to 32" Inside Sizes to read in thousandths or ten thousandths. Also Depth Gauges and Micrometer Sets.

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Highest quality, accurately cut Standard Stock Knurls ready for immediate shipment. Reed Special Finishing Process after hardening insures longest wearing Knurls producing best work. Special Knurls made to specification.

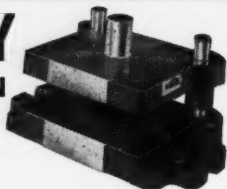
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## REED SMALL TOOL WORKS

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## DANLY PRECISION DIE SETS



Danly All-Steel Sets  
Danly Commercial Sets  
Danly Die Makers' Supplies

### DANLY SERVICE

7 Danly Warehouses Provide  
24-Hour Service for 85% of  
All Metal Fabricating Plants

### DANLY MACHINE SPECIALTIES, INC.

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Rochester, N. Y., 16 Commercial Street  
Cleveland, Ohio, 1444 East 49th Street  
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## DANLY DIE MAKERS' SUPPLIES

top face to receive the draw ring pins, is guided by a generous size piston stem protruding through the bottom of the piston cylinder.

The end of the threaded piston stem is provided with a precision adjusting hand wheel that predetermines the height of the piston face when the piston is at rest. This eliminates the necessity of correcting the length of the draw ring pins or stripper rods on com-



Dayton Rogers Universal Pneumatic Die Cushion

pound dies. This hand wheel adjustment is not only used to an advantage on the drawing dies, but it is very readily brought into use in adjusting the stripper to the correct height after the compound punch is ground, thus assuring the stripper at its correct height in its free or idle position.

Each pneumatic cushion unit is self-contained, consisting of its own air chamber and takes the air directly from the air line; consequently, the necessity of auxiliary air tanks is eliminated. It is also provided with a pneumatic hose connection from the regulating valve

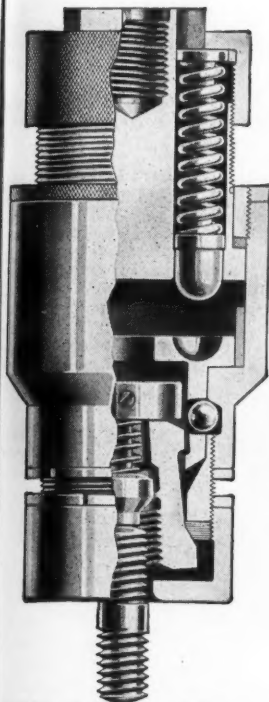
With degree Titan is full unit tools, high ing, t ness.

Pract be se range w'ich combi where

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# TITAN STUD SETTER

*the Only Stud Setter  
with the New Controlled  
Drive Clutch . . . . .*



With the Titan Stud Setter, you can set studs with a uniform degree of tightness without straining or mutilating threads. The Titan is a new controlled drive type for driving stud bolts and is full automatic in loading and releasing. This power-driven unit is adaptable to all types of drill presses, air or electric tools, both portable and stationary. It successfully operates at high or low speeds. Positive in driving and automatic in releasing, the studs may be set to any predetermined degree of tightness.

Practically any type of stud, including short length studs, can be seated with this new Titan tool. The great capacity, speed range and utility of this production tool, plus the added economy which its safety features assure through automatic operation, combine to make the Titan Stud Setter a profit-earning tool wherever it is used.



*Write for new illustrated circular.*

## TITAN TOOL COMPANY



FAIRVIEW,

PENNA.

with a pressure gauge recording the amount of air pressure used on each job. The cushion is designed so compact that it may easily be installed to the bottom side of the bolster plate through the hole in the bed of the punch press.

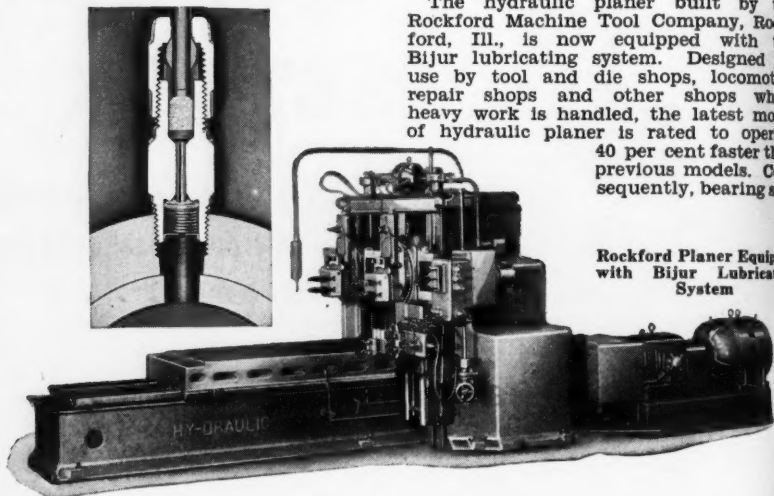
For drawing purposes the cushion is fastened with four cap screws to the

pounds, with a maximum drawing capacity of  $1\frac{1}{2}$  inches on all sizes.

### Application of Bijur Lubricating System to Hydraulic Planer

The hydraulic planer built by the Rockford Machine Tool Company, Rockford, Ill., is now equipped with the Bijur lubricating system. Designed for use by tool and die shops, locomotive repair shops and other shops where heavy work is handled, the latest model of hydraulic planer is rated to operate 40 per cent faster than previous models. Consequently, bearing sur-

Rockford Planer Equipped with Bijur Lubricating System

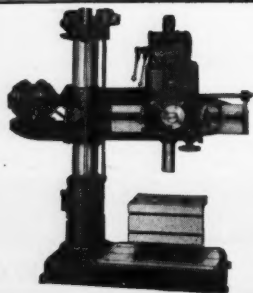


bolster plate. For compound blanking and piercing purposes the four spacing studs are used to allow for slug clearance between the top of the cushion and the bottom side of the bolster plate. In both cases, rigid and accurate alignment is always assured.

This universal cushion is now offered in five sizes having piston diameters from 4 inches to 12 inches, working pressure from one-quarter ton to five tons on an air line of 20 pounds to 150

faces which might otherwise be subject to increased wear and deterioration during continuous high speed runs are thoroughly protected and maintained at full efficiency by metered force-feed lubrication operated by the Bijur automatic lubricating system, manufactured by the Bijur Lubricating Corporation, Long Island City, New York.

The Bijur system automatically meters to each bearing the correct oil film required by that individual bearing—what-



## MORRIS "MOR-SPEED" RADIAL DRILLS

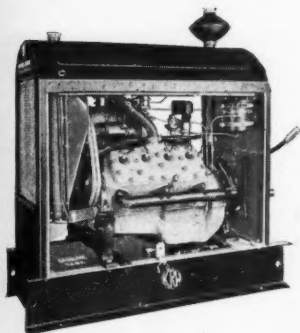
### FEATURE:

Rigidity—Convenience—Power—Simplicity—Low Cost.

Don't fail to investigate the "MOR-SPEED" line of Radials. Full facts on request.

**THE MORRIS MACHINE TOOL CO.**  
CINCINNATI OHIO

# Save with this low-cost KRW-FORD V8 EQUIPMENT



## Portable Power Plant

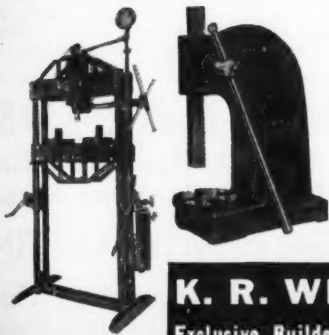
Up to 60-H. P., compact, portable—for line shafts, welders, compressors, hoists, pumps, amusement devices, well drillers, agricultural, oil field and contractors' equipment, etc., etc. The most complete industrial power plant built. Uses gasoline or natural gas. Will pay for itself out of savings in a few weeks.



## Electric Plant

Produce your own electric power at a fraction of present cost. Eliminate peak load and stand-by charges. The most complete plant ever devised—both 110 and 220 volts at same time—every protective device—20,000 watts. Runs on gasoline or natural gas.

## also HYDRAULIC and BENCH ARBOR PRESSES



New improvements, special built-in features and lower prices make KRW Hydraulic and Sensitive Arbor Presses an outstanding value. Three models, priced as follows, F. O. B. factory, Arcade, N. Y.

No. 37	35 ton	\$150.00
No. 37E	50 ton	\$180.00
No. 37F	70 ton	\$300.00
No. 37D	Bench press	\$28.50

Write for latest bulletins describing equipment in which you are interested. Power and Electric plants may be purchased through your local Ford dealer.

**K. R. WILSON - BUFFALO, N. Y.**

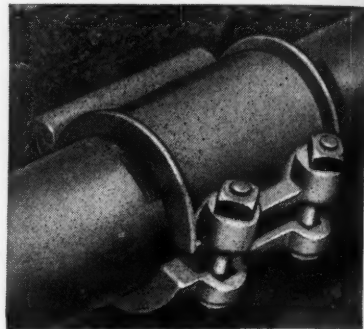
Exclusive Builder of Approved Ford Shop Equipment Since 1916

ever its size, speed or load. Distribution of the clean filtered oil is effected independent of changes in temperature or oil viscosity. Forty bearings on this machine, including those on the rail and side heads, feed change box, plain and needle bearings and slides, and other points, are serviced by this system.

### Skinner Clamp for Stopping Pipe Leaks

Leaks in pipe, regardless of size or pressure carried, can easily and permanently be stopped by the use of a special clamp that is made for this purpose

by the M. B. Skinner Co., 3679 W. Sample St., South Bend, Ind. The clamp is made from a metal of high tensile strength, uniform density and hardness. Every clamp is tested under a pressure of 3000 lbs. before it leaves the factory. To use, a gasket is placed over the leak and the clamp is placed in position around the pipe and over the gasket.



Skinner Clamp for Stopping Pipe Leaks

where it is clamped as shown. The gasket, sealed under tremendous pressure makes a permanent repair. The clamp will seal the leak under any temperature or any pressure, for steam, water, oil, gas, air, or chemicals.

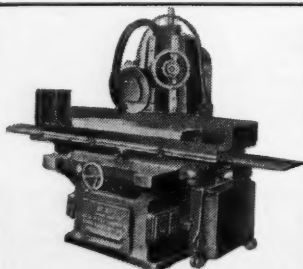
### Lyon Stock Handling Cart

An easy-rolling stock cart especially designed to speed up order filling and eliminate much of the time and trouble connected with stock handling has been brought out by Lyon Metal Products, Incorporated, Aurora, Ill. The cart, illustrated herewith, is 32 in. high, 30 in. long, and 16 in. wide. Its handy size permits its use in the aisles between storage bins, thereby eliminating the

## 1905 **Strand** 1937 Flexible Shaft Machines



For  
Nut Setting—  
Screw  
Driving—  
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Rotary  
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5001 NO.  
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Hydraulic Feed Surface Grinders  
Pay Big Dividends in Time Saved

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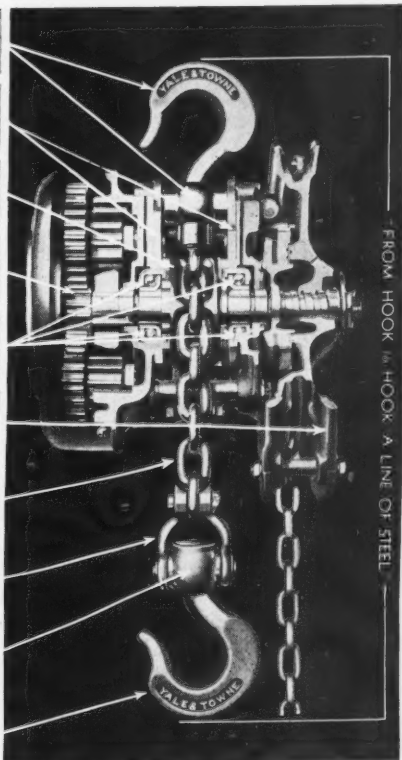
Mich.

# 10 REASONS WHY BUYERS SELECT YALE CHAIN HOISTS

*Because . . . Yale Chain Hoists have an international reputation for **QUALITY** and that quality is based on the outstanding features of construction, as follows:*

- 1 Heavy forged steel safety hook and cross head designed to withstand shock.
- 2 Heavy wrought steel suspension plates support the load between the top hook cross head and load sheave.
- 3 The load sheave on which the load is lifted is a massive special analysis steel casting.
- 4 The driving pinion is a one-piece forging of special steel.
- 5 Ball bearings upon which the load sheave is mounted are of high carbon chrome alloy steel running in chrome vanadium steel races.
- 6 A continuous and adjustable hand chain guide prevents snagging—with a tensile strength of 50,000 lbs.
- 7 The load chain is of steel, welded and heat treated.
- 8 Drop forged two-piece shackles with heat-treated suspension pin permit changing or replacing load chain without welding.
- 9 Lower hook is equipped with heavy duty ball bearing, completely enclosed, packed in grease, requires no further lubrication.
- 10 Steel safety hook opens slowly without fracture before any other part of the hoist is overstrained—protects operator and load.

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FROM HOOK TO HOOK A LINE OF STEEL

**Distributors Make Yale Hoisting Equipment the Easiest to Buy.**

Capacities 300 Lbs. to 40 Tons



**THE YALE & TOWNE MFG. CO.**  
PHILADELPHIA DIVISION, Philadelphia, Pa. U. S. A.



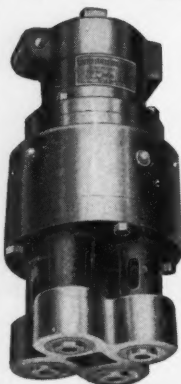
*For Wheel Dressing  
Efficiency and Economy*

## KOEBEL DIAMOND TOOLS

*Send for Complete Information  
Data and Price Sheets*

**KOEBEL DIAMOND TOOL CO.**  
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## U. S. SPECIAL DRILL HEADS

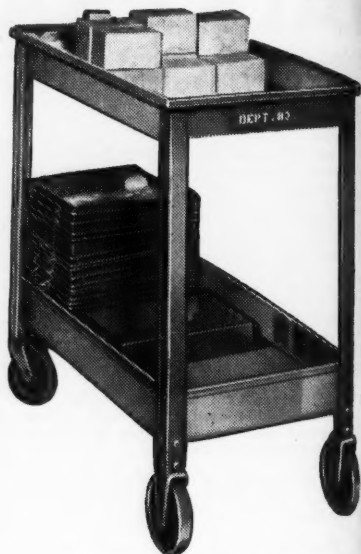


U. S. Drill Heads are made in standard and special sizes. If your job requires special drill heads, our years of specialization in this work will save you money and assure an accurate, dependable and swift job. Send your blue prints for estimates.

**The United States Drill Head Co.**  
1354 Riverside Drive  
CINCINNATI, OHIO

many steps which would be required to load larger trucks in the main aisles of the stockroom.

The truck is equipped with four large rubber-tired casters, the front casters being swivel and the rear casters, stationary. The two shelves are 3 in. deep and



Lyon Stock Handling Cart

another shelf may be added if desired. The truck is finished in green enamel.

### Norma-Hoffmann Self-Sealed, Feltless Precision Bearing

Norma-Hoffmann Bearings Corporation, Stamford, Conn., announces its new "9000" Series of Self-Sealed Precision Ball Bearings. The series is offered in two types—the "9000-D" Series, with single side shield, and the "9000-DD" Series, with two side shields. These bearings employ inwardly extending, closely-fitted flanged shields of advanced type, which do not rotate or contact with rotating seal parts, are equally effective in retaining grease in a horizontal or vertical position and, not being subject to any wear whatsoever, permanently maintain their efficiency.

The metal seals clear the recess on the inner ring, obviating the possibility

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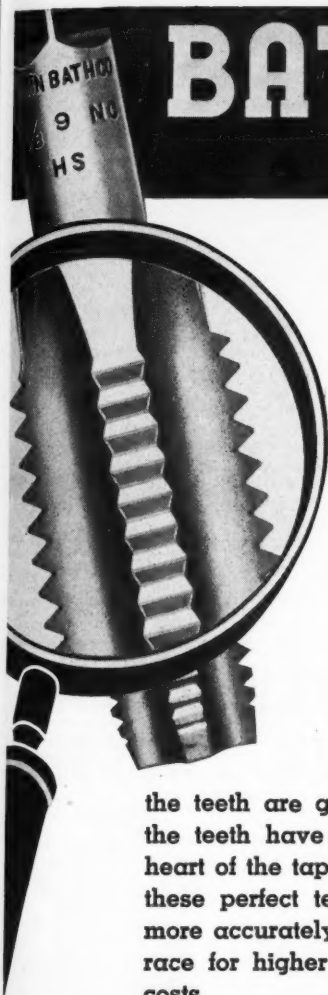
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# BATH TAPS

*offer*

## PERFECT TEETH that produce PERFECT THREADS

As surely as perfect teeth produce perfect threads, so surely does GRINDING FROM THE SOLID AFTER HARDENING (the process by which every BATH TAP is made) produce those perfect teeth. By the BATH process blanks are first given thorough and uniform hardening and then with patented BATH machinery,

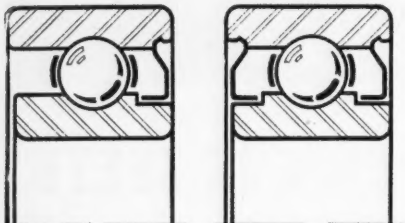
the teeth are ground. Thus even the thinnest edges of the teeth have the same perfect grain structure as the heart of the tap—neither too hard nor too soft. Naturally these perfect teeth stay sharp longer, cut cleaner, and more accurately, making BATH TAPS real leaders in the race for higher production, greater accuracy and lower costs.

**JOHN BATH & COMPANY, INC.**  
**WORCESTER • MASS.**

**IT PAYS TO BUY BATH "Ground From The Solid" TAPS**

of drag or friction resistance. Consequently, there is no power loss, which means higher speeds and increased efficiency in certain types of units. The shields occupy less space within the

absolute cleanliness at all times. Available in a full range of sizes and interchangeable with single felt seal bearings of the wide outer ring type from 6 m/m to 26 m/m in bore, this series is fully described in catalog F-951-B.



"9000-D" "9000-DD"

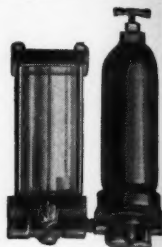
Drawing showing design of Norma-Hoffmann "9000" Series Ball Bearings

bearing than the standard felt seal, and the "9000" Series has greater grease capacity and a more lasting lubricant supply for long continuous service.

In the "9000-DD" type, the bearings are totally sealed against the entrance of dirt or foreign matter during assembly, operation or disassembly, providing

## M-B Automatic Air Line Lubricator and Filter

The combined advantages of the M-B Lubricator and the M-B Filter are offered in the M-B Automatic Air Line Lubricator and Filter illustrated herewith. Assembled in one unit, this device, product of M-B Products, 130 E. Larned St., Detroit, Mich., is effective in removing all foreign matter, dust, pipe scale, moisture, and so on, from the air line after which it saturates the air with any desired volume of oil.



M-B Automatic Air Line Lubricator and Filter

## For Accurate Holes- COMTORPLUG "The 5-question Plug"



Checks  
holes for  
Size  
Roundness  
Back taper  
Front taper  
Bell mouth

Comtorplug answers all 5 questions, to .00005", at production-inspection speed.

IDEAL FOR BALL BEARING  
HOUSINGS

THE **COMTOR** CO.

Waltham, Mass.

Est. 1928

## CYLINDRICAL SUB - PRESSES

Are especially desirable for producing clean cut, accurate parts with compound dies. For after operations, swaging, piercing, trimming, etc., the overhang type is preferred. We have had a long experience in making such dies. Please send us samples or drawings for estimate.



ARCH TYPE

**Waltham Machine Works**

WALTHAM, MASS.

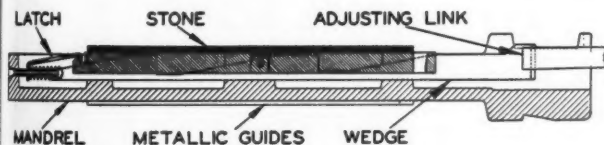
# The New SUNNEN PRECISION HONING MACHINE



**Price Only \$95**

Plus Mandrels, Stones, etc., desired.

*A fast, accurate method of sizing and finishing small holes from .480" to 2.400" in diameter and up to 7" in length in any material except lead or babbitt. Can be set up for any job in one minute. Cutting pressure controlled through foot pedal. Micrometer stop prevents grinding oversize and makes it easy to duplicate sizes. Particularly adapted for salvage, small run production, assembly, tool room and experimental work.*

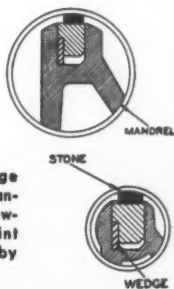


## The SUNNEN MANDREL and EXPANDING STONE

The cross section drawings above and at the right show the design of the Sunnen mandrel with its expanding stone. Notice how the wedge supports and raises the stone—keeping it rigid and absolutely parallel to the center line of the mandrel. It is this patented design that makes possible the unusual accuracy of the Sunnen Precision Honing Machine.

## SUNNEN PRODUCTS COMPANY

7903 Manchester Avenue  
St. Louis, Missouri  
Chatham, Ontario



End view of large and small size mandrels and stone showing the three-point contact afforded by this design.

**FREE** Write for free folder giving complete information on this new, valuable piece of equipment. At the same time tell us about any grinding problem you have—giving us the size of the hole, the kind of metal, amount of stock to be removed and your tolerances. If possible send along a print. We'll gladly tell you just what this machine will do for you.

**SUNNEN**

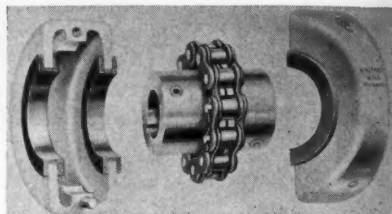
ONLY WITH ABRASIVES IS IT POSSIBLE TO PRODUCE SMOOTH ACCURATE SURFACES.

The unit has been tested and approved for lubricating air valves, cylinders, controls, pneumatic tools, and so on, and is invaluable in any place where clean, lubricated air is desired. The use of this lubricator will eliminate costly shut-downs caused by dust in the air lines and lack of lubrication at working points. The M-B Automatic Air Line Lubricator and Filter is available in capacities of  $\frac{1}{4}$ -in.,  $\frac{3}{8}$ -in.,  $\frac{1}{2}$ -in.,  $\frac{3}{4}$ -in., and 1-in. with standard pipe tap inlet and outlet connections.

### Whitney Roller Chain Flexible Coupling and Coupling Cover

The Whitney Roller Chain Flexible Coupling, product of The Whitney Chain & Mfg. Co., Hartford, Conn., is made in the special wide chain design to give maximum chain roll and sprocket tooth bearing area, which is the most important factor in coupling life. The single chain design allows the shearing stresses to be taken by the combined cross-section of the chain pin, bushing and roll, which gives maximum strength. The coupling is designed with a cast aluminum cover to provide for proper lubrication. The cover grips the chain roll at both sides, giving a positive cover

drive with balanced construction. The cover is of cast aluminum, has a smooth surface for safety, and adds to the appearance of the equipment on which it



Whitney Roller Chain Flexible Coupling and Coupling Cover

is used. The coupling and cover can be disconnected without disturbing shafts or bearings.

### Beaver No. 60-R Ratchet

The illustration shows the Beaver No. 60-R Ratchet which is now available from Beaver Pipe Tools, Inc., Warren, Ohio. The No. 60-R Ratchet is made in sizes from  $\frac{1}{4}$  to  $1\frac{1}{4}$  in. and because of its sturdy simplicity and useful



### FOR ALL WHEEL DRESSING OPERATIONS

The new EVER-SHARP DIAMOND TOOL is made with a long, natural shaped diamond—requires no resetting—is adapted to ALL types of wheel dressing operations—economical—accurate.

WHEEL TRUEING TOOL CO., INC.  
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• These Handy Racks will keep your stock neatly piled and assorted alongside the operator—no need to fumble through bins of scattered supplies—stock checked at a glance. Shipped on approval. Low in price.

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Wm. S. Yohe Supply Co.

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Canton, Ohio



Write for quotation on standard  
Woodruff Keyway Cutters

Special Cutters made to  
Blue Prints

QUALITY  
TOOL WORKS

Waukegan, Illinois

## FOR YOUR BIG PRODUCTION SMALL TAPPING

# Ettco - Emrick

The combination of our gravity foot operated tapping machine and STANDARDIZED SYSTEM of sensitive multiple tapping heads is—

**THE FASTEST MANUAL TAPPING**  
Known to the Art

# 7000

**Tapped Holes Per Hour Per Operator**  
Is a Modest Statement

You furnish a quantity job—we'll lick your costs.

Even your single tapping should be done with our Foot Operated Machine, if you want to make two holes where only one grew before.

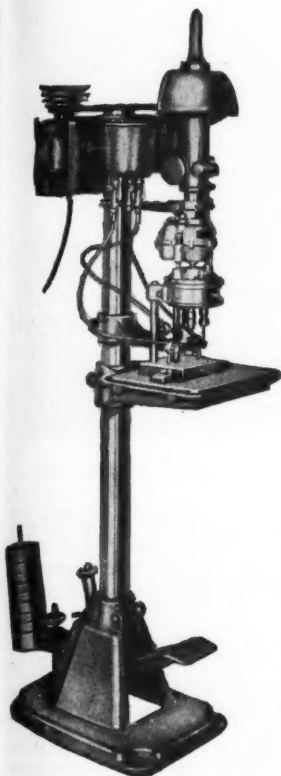
Let us have your *Blueprint* for a **MULTIPLE HEAD** quotation.

Ettco-Emrick TAPPING ATTACHMENTS  
Catalogue?

# ETTCO TOOL CO.

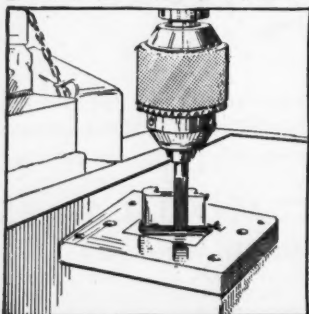
594 JOHNSON AVE.,

BROOKLYN, N. Y.

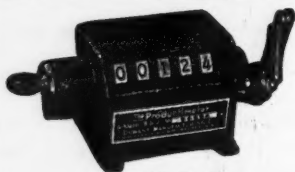


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ROTARY FILES  
SAVE MONEY



Rotary Filing Punch in Drill Press  
70 SHAPES & SIZES IN STOCK  
Send for Catalog and Price List.  
**ROTARY FILE COMPANY**  
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## "THE RIGHT COUNTERS FOR THE JOB"—

When you specify Productimeters.  
Backed by 57 years' experience.

Built by the largest exclusive  
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[THE SPEEDOMETERS OF INDUSTRY]

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**DURANT MFG. CO.**

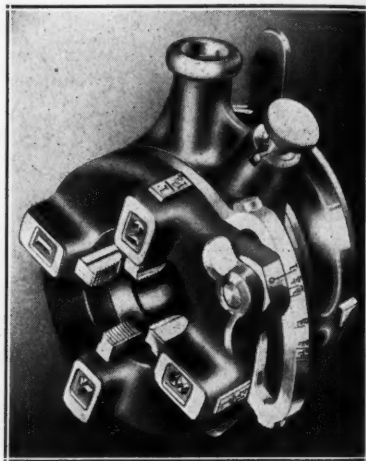
1932 N. Buffum St.  
Milwaukee, Wis.

173 Eddy St.  
Providence, R. I.

TELL US WHAT YOU WANT TO COUNT

range, this tool will appeal wherever hand threading must be done on a wide range of work.

Three sets of dies, each threading two sizes, cover the range. The dies are quickly changed and are fully adjustable for cutting standard, oversize or undersize threads. A three-jaw, self-centering chuck centers the pipe; no bushings or grip screws are required. The dies are well above the face of the stock



Beaver No. 60-R Ratchet

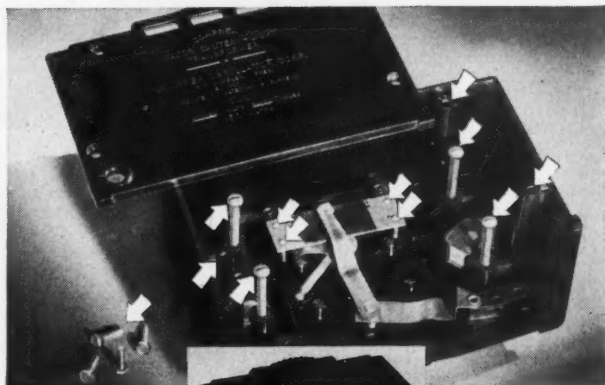
where they will be easy to oil and the chips will have plenty of clearance. The ratchet and ratchet pawl are extra heavy. The tool is of unbreakable air furnace malleable iron and is provided with a rust-proof finish.

## "Cone" Worm Gear Cutting Machine

As a result of cooperation of Gould & Eberhardt and the Michigan Tool Company, the latter located at 7171 McNichols Rd., Detroit, Mich., equipment for large scale production of "cone" worm gearing with from 3 to 5½ in. center distances has been developed. This range of center distances, which includes all conventional ratios, covers the entire intermediate field of "cone" gearing sizes. "Cone" worm gears for automotive rear axle equipment all fall within the range of 3 to 4½ in. center distances, including both passenger cars and light trucks. The cutting time is said to be less than

This shows how a Parker-Kalon Assembly Engineer can help

## TO MAKE A FINE PRODUCT - YET KEEP PRICE DOWN



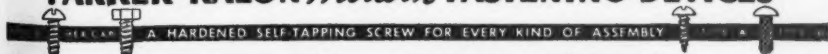
**H**OW cost and quality are directly affected by the assembly method employed is shown by the Comrex Major Cautey - Diagnostic Light Transformer. To assemble the various parts is not a complicated matter. It could be done by using machine screws in tapped bushings molded into the housing. Yet, because the maker was well-informed on the advantages of Parker-Kalon Hardened Self-tapping Screws, a worthwhile saving was made. Use of these unique Screws eliminated bushings and brought a direct reduction in the cost of the housing. It also removed the possibility of trouble and expense from stripped threads. In addition, stronger assemblies were obtained since Self-tapping Screws hold better.

The assemblies involved are indicated by arrows and include fastening a coil and core unit; the small resistance coil; the two contact arms and knobs; the switch knob, and also the housing cover.

In 7 out of 10 cases where metal or plastic assembly is involved Self-tapping Screws can be used to make a product better, at less cost. The function of Parker-Kalon Assembly Engineers is to help design and production men uncover all of the possibilities for using Self-tapping Screws to simplify fastening jobs and save money. Whether your product is in the drawing stage or in actual production it would pay you to take advantage of the services of a Parker-Kalon Assembly Engineer. An invitation will bring one.

PARKER-KALON CORPORATION, Dept. M, 198 Varick Street, New York, N. Y.

### PARKER-KALON *Modern* FASTENING DEVICES



SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS

that required for bevel gears, production being estimated as around 15 gears per hour per machine, working from the rough blank.

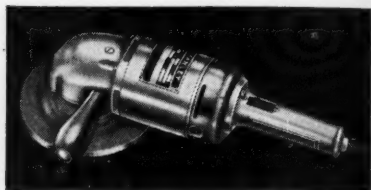
"Cone" gearing is notable for its unusually high contact area, claimed to be some 20 times that of conventional worm gearing. This goal is achieved by novel production methods based on cutting the wheels and worms without tangential or in-feed of the cutting tools, the cutter being mounted in the exact center distance of the corresponding mating worm or wheel. Efficiencies of from 97 to 99 per cent for all road loads are indicated.

### Stanley Electric Disk Sander

The Stanley No. 77 Electric Disk Sander, built by Stanley Electric Tool Division, The Stanley Works, New Britain, Conn., and illustrated herewith, is a rugged, powerful tool designed and built for production and repair work. Equipped with ball bearings throughout, it is sturdily constructed, streamlined for use in close places, light in weight, and exceptionally easy to handle. Power is supplied through a high speed universal motor enclosed in a strong aluminum alloy housing. The tool is

furnished complete with a 7-in. flexible pad, 12 sanding disks, wrenches, and a heavy rubber-covered three-conductor cable.

The sander is a versatile tool and is



Stanley Electric Disk Sander

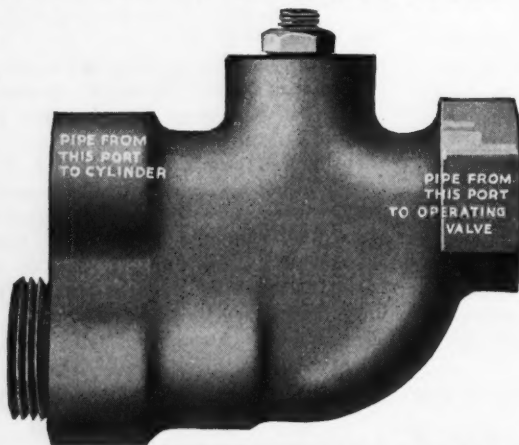
especially useful in scouring metal parts such as pipes, for sanding metal and wood, removing paint and rust, polishing finished surfaces, and so on.

### Federal Horizontal Open Back Inclinable Press

The Federal Press Company, Elkhart, Ind., has added a line of horizontal open back inclinable presses to the line of vertical open back inclinable presses made by this firm. The horizontal press

## HOPKINS SPEED CONTROL VALVE

for COMPRESSED AIR CYLINDERS



Control the speed of your cylinders. Make them function as fast or as slow as you wish, without affecting the pressure, of course. Pipe one of these in the line from the valve to the cylinder, or if both the forward and reverse strokes are to be controlled, pipe one in the line to both ends of the cylinder.

These valves are available in  $\frac{1}{4}$ ",  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1" I. P. S.

THE TOMKINS-JOHNSON CO.  
620 N. MECHANIC STREET JACKSON, MICHIGAN

# NEW STRENGTH!

## *Sensational* PERFORMANCE



Five sizes, 4, 6, 8, 10, 12" in natural polished steel. Also, semi-finished.

**WILLIAMS' ADJUSTABLE Carbon Steel Wrenches** are actually stronger than any wrench of their type and class on the market. That strength means safety, economy, durability to you. *Drop-forged* from special, strong, tough steel... accurately *heat-treated*—their superior design features guarantee better performance.

## Also WILLIAMS' "SUPERJUSTABLE" WRENCHES

Same superior design features, but forged from **Chrome-Alloy Steel**—thin, light, strong. Finished in chrome-plate with highly polished heads and "satin" finish handles. Five sizes, 4, 6, 8, 10, 12".



**WILLIAMS**  
SUPERIOR DROP-FORGED TOOLS  
**ADJUSTABLE  
WRENCHES**

### J. H. WILLIAMS & CO.

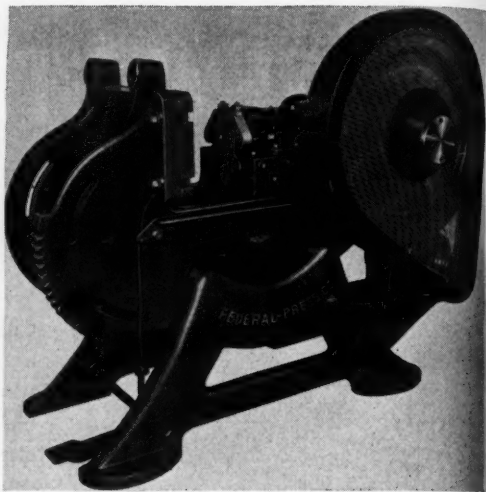
75 Spring St., New York

Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs, Vises, etc.

is constructed along the same lines as the regular Federal presses, and is mounted on extra heavy legs. Special features include unusually long ram guides with wide flat bottom and angular top and with bearings fitted to gibs with adjustment from either side, making it possible to maintain perfect alignment at all times.

The Federal horizontal press is especially adaptable for automatic feeds and is equipped with the improved built-in Federal non-repeat sliding key clutch mechanism which has been a feature of Federal design. Another outstanding feature of the line is a Timken roller bearing flywheel. The bearing in the flywheel eliminates a large amount of former press troubles and is said to last practically the life of the press.

The press can be furnished with the Federal patented brake release and bronze bushings in the main and crank bearings if desired. It is equipped standard with bolster plate, upper knockout bar in ram,



Federal Horizontal Open Back Inclinable Press

knockout bracket on the frame and a complete set of wrenches. The horizontal press is built in a variety of sizes and can be supplied with direct V-belt motor drive or to be driven direct from the line shaft as desired.



## RIVETING?

**LINLEY NOISELESS ROTARY RIVETING MACHINES**

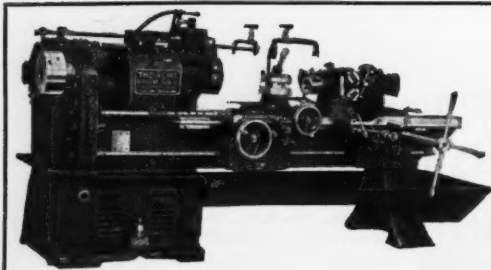
Assure Peak Production and Lower Maintenance. Rigid and Powerful. Bench and Floor Types. Motor or Belt Driven. There is a Linley machine for every riveting job.

Send Samples of your Work and we will furnish accurate estimate of production and quote cost of equipment.

**LINLEY BROTHERS CO.**  
583 Fairfield Avenue  
Bridgeport, Conn., U. S. A.

### General Electric OX-1 Oil-Immersed Shockproof Industrial X-Ray Unit

An inexpensive X-ray apparatus for radiographic examination of castings and welded joints of intermediate thickness, to be known as the G-E OX-1, has been brought out by General Electric X-Ray Corporation, 1212 Jackson Blvd., Chicago, Ill. The unit is complete, shockproof, compact, flexible and versatile. Oil immersion of high voltage parts reduces

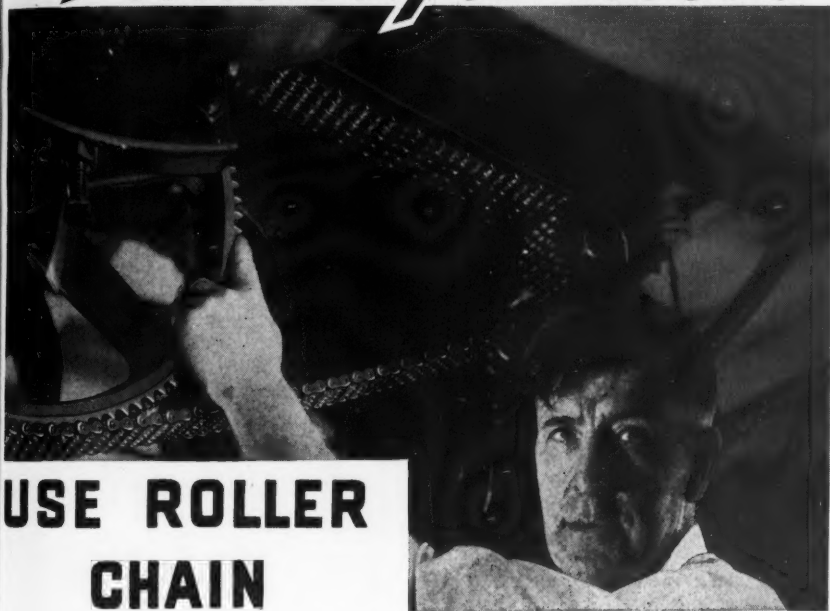


### Cincinnati Acme Universal Turret Lathes

A powerful rigid machine for a wide range of accurate bar and chuck work.

*Write for Circular*  
**THE ACME MACHINE TOOL COMPANY**  
**CINCINNATI, OHIO**

# for Economical Primary Drives



## USE ROLLER CHAIN

Motor to line shaft — a "natural" for Baldwin-Duckworth roller chain. The modern small pitch, multiple strand roller chain is light in weight, over 98% efficient, quiet in operation and economical in first cost, and — this may surprise you — operates over short centers at speeds as high as 4000 ft. per minute.

Do away with trouble — do away with adjustments — do away with early and expensive replacement — use Baldwin-Duckworth roller chain. Let our engineers send you catalog and data for selecting the best drive for your needs. Baldwin-Duckworth Chain Corporation, Springfield, Mass.

# BALDWIN-DUCKWORTH

# Cuts



## LIKE A KNIFE

*This **RIDGE** Pipe Cutter with thin Super-Steel Wheel Blade Rolls Right Through Any Pipe.*

No. 1 for 1/4" to 1 1/4" pipe; No. 2 for 1/2" to 2" pipe; No. 3 for 1" to 3" pipe; No. 4 for 2" to 4" pipe.

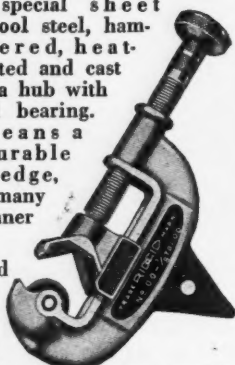


The remarkable ability of the **RIDGE** Cutter to cut far more pipe easily and practically without burr lies in its unusual cutter wheel.

For instead of being cut off of a bar of steel, the thin blade is coined from special sheet tool steel, hammered, heat-treated and cast into a hub with steel bearing.

This means a more durable cutting edge, giving many more cleaner cuts.

The reinforced housing guarantees straight cutting and long life for the tool.



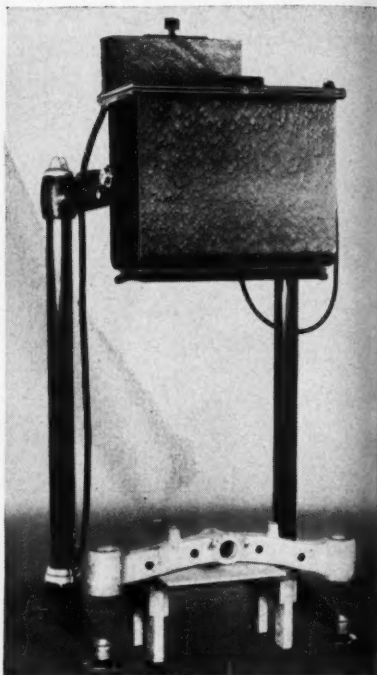
Made in two sizes: No. 00 for 1/8" to 1" tubing. No. 0 for 1/2" to 2" Super-Steel Cutter Wheel. V-pad smooths tubing ready to solder; handy reamer.

### THE RIDGE TOOL CO.

Elyria, Ohio, U. S. A.

## RIDGE PIPE TOOLS

insulation space requirements to a minimum. The entire unit, including the floor stand, can easily be installed in a room 5 ft. wide, 6 ft. long and 10 ft. high. This permits sufficient space for the radiographic examination of small castings. For mobile purposes the entire unit can be mounted on a truck 3 ft. wide and 4 ft. long. The entire high voltage system is encased in grounded

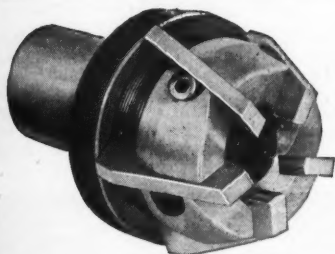


General Electric OX-1 Oil-Immersed Shockproof Industrial X-Ray Unit

metal, making the unit 100 per cent electrically safe. All high voltage generating equipment, including transformer and X-ray tube, are sealed in oil in a single welded tank which makes this equipment shockproof and, except for the radiographic aperture, X-ray proof.

The high voltage head is mounted on trunnions so that it may be angulated to any position for radiographic work. The head is held in position by adjustable friction clamps, which permit easy manipulation. Rated at 8 ma., 200,000 volts peak, the standard unit requires

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## GENESEE ADJUSTABLE HOLLOW MILLS

*Are Cutting Costs Everywhere*  
**SEVEN DIFFERENT STYLES**

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now.

Write for catalog

**GENESEE MFG. CO., Inc.**

141 No. Water St., Rochester, N. Y.



**Standardized  
JIG BUSHINGS**  
Acme Standard  
over 6700 items  
A.S.A. Standard  
over 4200 items



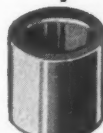
Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

Send for bulletin, containing complete details, sizes available and low prices.

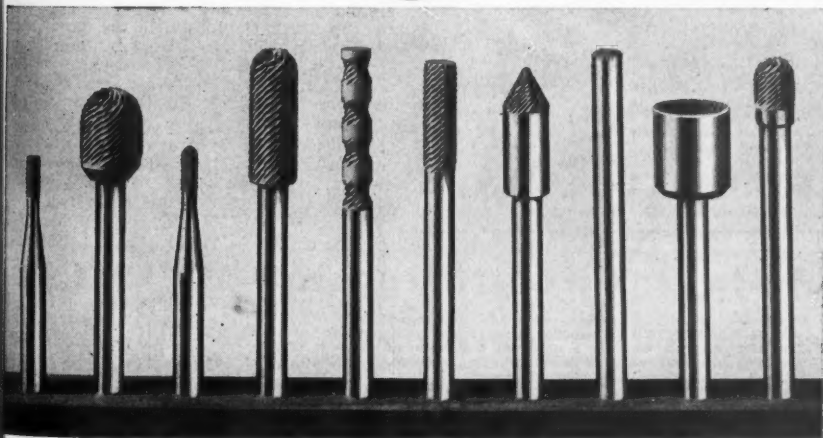


**ACME  
INDUSTRIAL  
COMPANY**

212 N. LaSalle St.  
Chicago, Ill.



## FORD HAND CUT ROTARY FILES



Just a few of the many standard shapes which are carried in stock.  
Write for full information.

108 HARRISON STREET **M. A. FORD MFG. CO.** DAVENPORT, IOWA

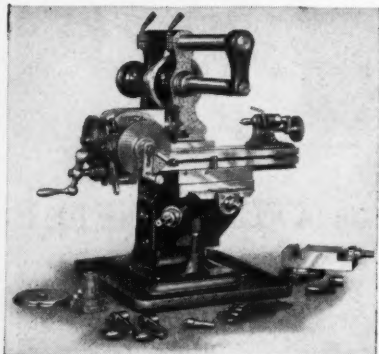
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200 to 260 volt, 50 or 60 cycle, single phase power supply. The 200 Kv.P. oil-immersed unit can be taken to the job anywhere, indoors or out. All electrical controls are centered in a modern panel type control unit, which can be mounted on the wall for stationary units or in a small lead lined cab for mobile units. An overload circuit breaker protects the equipment during operation. Neither the electrical characteristics nor X-ray output is affected by altitude, temperature, dust or humidity even to the point of rain.

The machine will radiograph 2½ in. of welded low carbon plate or 3 in. of cast steel in economical time.

## "Stark"



### SPiral • UNiversal • PLAIN

The most accurate by far. Ideal for tool-room and laboratory.

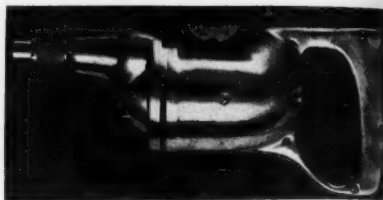
Motor Drive Unit or countershaft.

## STARK TOOL CO.

Estab'd 1862 Waltham, Mass.

### ¼-In. Jasco Junior Drill

The ¼-in. Jasco Junior Drill, shown in the illustration, is the latest addition to the line of drills manufactured by the Jas. Clark, Jr., Electric Company, Louisville, Ky. The drill is of the light duty type and is the most powerful drill for its weight in this class. It weighs



¼ In. Jasco Junior Drill

but 3¼ lbs. with an overall length of 10½ inches.

The drill has been designed especially for use in garages, repair shops, and for maintenance where the work is only intermittent. It makes an ideal tool for installation men to carry in their tool box.

The frame, gear plate and gear head are sand cast from a special aluminum alloy designed to have great strength and durability. The motor, especially designed and manufactured for this drill by the Clark Company, is the same high quality as the motors used in their other tools. The motor is universal operating on either A.C. or D.C., air cooled by an oversize fan and improved type slotless air ducts.

The armature bearings are of graphite impregnated bronze. The spindle revolves in a grease lubricated bronze bushing with an oversize ball thrust bearing to take care of the thrust load.

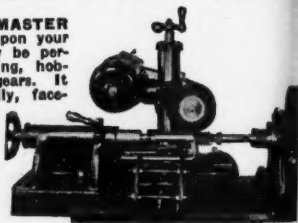
## Adjust Two Bolts and--PRESTO!

Your lathe becomes a machine of many functions. **THE MASTER LATHE CONVERTER** is precision built, is easily mounted upon your lathe and instantly becomes a universal tool with which may be performed such operations as milling, grinding, drilling, broaching, hobbing. It cuts keyways, spline shafts, gears. It hobs worm gears. It broaches internal keyways. It grinds internally and externally, face-plate and shaft grinding.

Write for illustrated pamphlet.

**MASTER MACHINE & TOOL COMPANY**

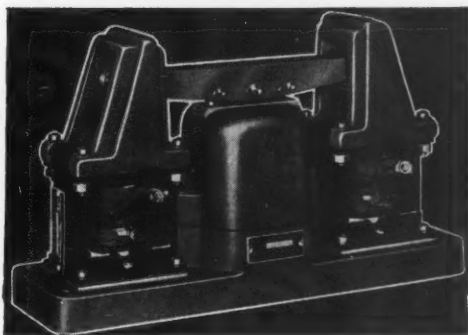
P. O. Box 7365, North Kansas City, Missouri.



*One Q. A. W.  
User Reports*

## 50 MILLION OPERATIONS

*without leakage — without repairs and still going strong even without inspection.*



### GUARANTEED LEAK-PROOF

No other type of control valve will outperform Q. A. W.'s no metal-to-metal wear with stainless steel body and short travel.

*Quick-As-Wink*

**FOR AIR VALVES FOR WATER**

C.B. HUNT & SON - SALEM, OHIO  
DISTRIBUTORS IN PRINCIPAL CITIES



#### THE Q. A. W. VALVE

Shown above is a momentary contact-type double solenoid—no burnouts—Current "time-on" only an instant, lowest possible. Hundreds of other Q. A. W. assemblies. Ask for Catalog "1M".

## Use PULLMORE CLUTCHES

for HEAVY LOADS, 24 HOUR SERVICE



Illustrated is a Howell Industrial Truck in which a single type Pullmore Clutch, operating dry, is used to raise and lower the load. In many of these trucks Pullmore Clutches are subjected to heavy loads, hard service 24 hours a day, and it hasn't been necessary to replace a Pullmore in the several years of Howell experience. If

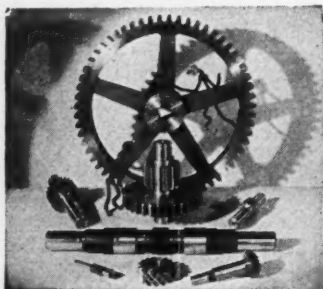


you manufacture trucks, cranes, machine tools, or similar equipment—use Pullmore Clutches, they are reliable, efficient, durable, economical. Investigate. Write today for new booklet.

#### ROCKFORD DRILLING MACHINE DIVISION

Borg-Warner Corporation, 300 Catherine Street, Rockford, Illinois  
Sold by MORSE CHAIN CO., Ithaca, N. Y. With offices in principal cities

Pullmore Clutches are made in single and double types, for operation in oil or dry, in capacities up to 75 h.p.



"THEY LIVE ON THE JOB"

Mass.  Gears

Have the qualities  
which you expect in  
your gearing.

*All Types and Materials.*

**Massachusetts Gear & Tool Co.**

27 Nashua St. Woburn, Mass.



**COLONIAL  
DRILL JIG  
BUSHINGS**

A. S. A. STANDARD

You are sure of getting accurate and dependable drill jig bushings when you order COLONIAL. Made of High Grade Tool Steel. And when you order COLONIAL, you'll get them quickly.

Write for  
Specification  
Sheets and Prices

**Colonial  
Bushings, Inc.**

145 Jos. Campau St.  
DETROIT, MICH.

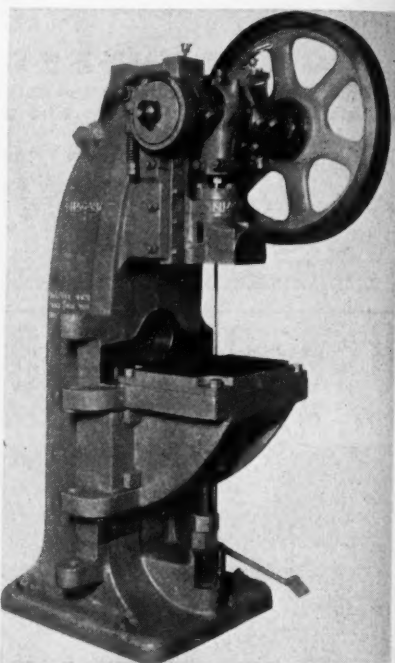


The drill runs at a free speed of 2,000 r.p.m. The switch is the latest improved type off and on.

The Jasco Junior drill is furnished complete with a three jaw key type chuck and twelve feet of rubber covered cord with unbreakable rubber plug.

### Niagara Horn Press with 14-Point Sleeve Clutch

Niagara Machine & Tool Works, Buffalo, N. Y., announces the addition of the 14-Point Sleeve Clutch with Built-



Niagara Horn Press with 14-Point Sleeve Clutch

In Single Stroke Mechanism to the standard equipment on the complete line of Niagara Horn Presses.

Features of the Niagara Sleeve Clutch which have won wide acceptance among Niagara press users include speed with safety, instant engagement, built-in single stroke mechanism with throwout running on anti-friction bearings, positive lock for use when setting dies, large striking and driving surfaces and long

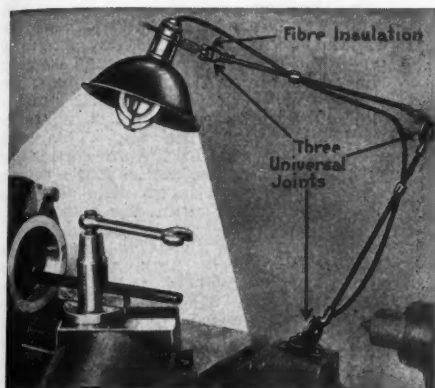
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## Wherever You Need Concentrated Lighting . . .



**NEW FEATURE:** Clamps on arms to carry cord. Because cord is completely outside of bracket, it is not damaged by movement of universal joints.

## The Answer is SEARCHLIGHT Lamp Brackets

- **COMPLETELY UNIVERSAL.** Spot the light on the work from any angle.
- **STRONGLY BUILT.** Steel rods set in sturdy die-cast universal joints.
- **EASILY MOUNTED** on machine, bench, wall, or drafting table.
- **LOW PRICE** with discounts for quantities. Send for circular.

## McCROSKY TOOL CORPORATION

MEADVILLE, PA.

Use Nos. 53 and 55  
for Large Volumes  
--- High Pressures

## Helical Gears and Ball Bearings

insure quietness and dependability in supplying oil under pressure for hydraulic operation of machines.



Ask for Catalog on Geared, Vane and Centrifugal Pumps. Brown & Sharpe Mfg. Co., Providence, R. I.

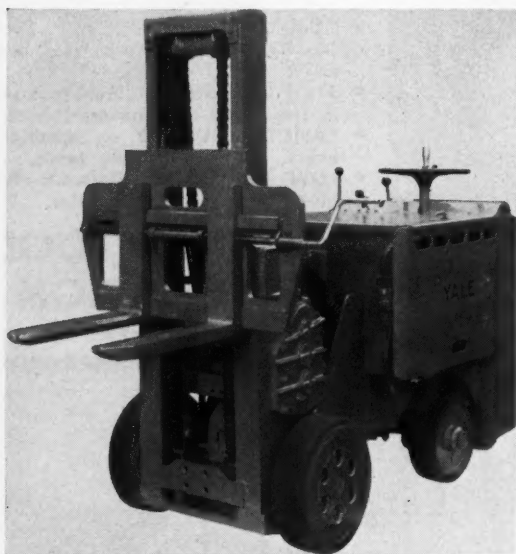


# BROWN & SHARPE PUMPS

life. The patented Niagara 14-Point Engagement Sleeve Clutch is available only on Niagara machines.

### Yale Truck for Pig Metal Handling

The modern conventional fork type of industrial high lift truck can now be



Yale Truck for Pig Metal Handling

adapted with success for use in pig handling in the metal refining industries and yet retain general utility for the pallet system of handling usually ascribed to the fork truck.

The truck illustrated, product of The

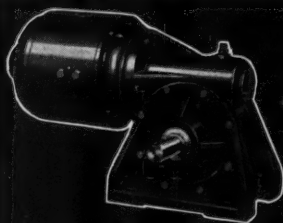
Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia, Pa., is designed to grip the pigs firmly and hence with safety, and can be laterally adjusted by a hand crank to handle any length of pig. The sharp bevelled inside edges of the forks enable them to support the pigs by actually biting into the underside curvature of the protruding lip or ear of the pig. This truck has a maximum capacity of 4000 lbs. and is built to turn around in an aisle only 6 in. longer than the total length of the truck and load.

The battery compartment permits both top and side removal of the battery, and also the battery connector plug can be quickly disconnected because it is accessible on the outside of the battery compartment. Other salient features are wheel steering through gear reduction, interlocked controller provided with double safety, two sprocket hoist chains, each capable of supporting the load through triple gear reduction, double reduction drive unit, all welded unit assemblies, drop forged chrome nickel steel gears throughout, and weighted drive wheels.

### Super Speed Punch Press

The illustration shows the Super Speed Punch Press which is now being marketed by Super Speed Press Corporation, Riverside, N. J. The machine

is intended for high speed production, working at speeds as high as 350 strokes per minute. The continuous feeder, which is said to be absolutely accurate, never allows the stock to stop. The



## JANETTE MOTORIZED SPEED REDUCERS

For obtaining slow speeds

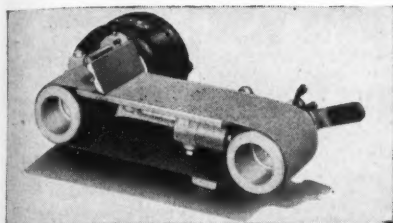
16 standard types—foot—flange and foot and flange mountings. Worm—Helical—Spur and Planetary gears. 1/50 to 1/10 H.P. sizes.

Made by a company which has built geared apparatus since 1909  
Rotary Converters—Generators—Motors—Motor-Generators

JANETTE MANUFACTURING COMPANY

550 W. Monroe St., Chicago, U. S. A.

New York—Philadelphia—Boston—Pittsburgh—Milwaukee



## • NEW An Inexpensive ABRASIVE BAND GRINDER . . .

*"Built Like a Machine Tool"*

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION, complete with grease gun.

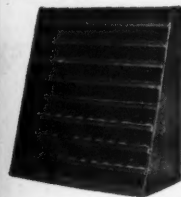
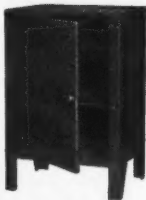
*Write for illustrated folder on this and other styles and sizes.*

**HORMEL-M GRINDER**  
WALLS SALES CORP.

96 WARREN ST. NEW YORK, N. Y.

## STEEL EQUIPMENT A COMPLETE LINE

No. 36-24 Tool cabinet—Gives you tool storage under lock and key. Tray top serves as a work table. Two adjustable shelves. Over-all dimensions, 24" wide by 16" deep by 36" high. Olive green finish.



No. 108 Drill & Reamer Cabinet — Has 9 shelves with a total of 108 compartments. For storing various sizes and lengths of drills and reamers. Continuous label holders on shelves. Furnished with or without check hooks.

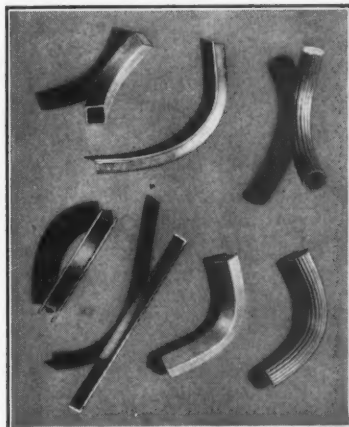
*Write for catalog "DM"*

**Angle Steel Stool Co.**

Plainwell

Michigan

## Bend it safely with CERROBEND



Cerrobend is a low-temperature-melting metal (160° F.) used as a filler for bending tubing and metal moulding. Poured molten into thin-walled tubing or around metal moulding and chilled, it permits bending to small or medium radii without wrinkling, buckling, flattening or rupture. Does not "tin" or adhere to tube or moulding surfaces. After use, the alloy may be melted from the tube or moulding by immersing in hot water or steam and may be used again and again. Send for prices and further information.

**CERRO DE PASCO  
COPPER CORPORATION**

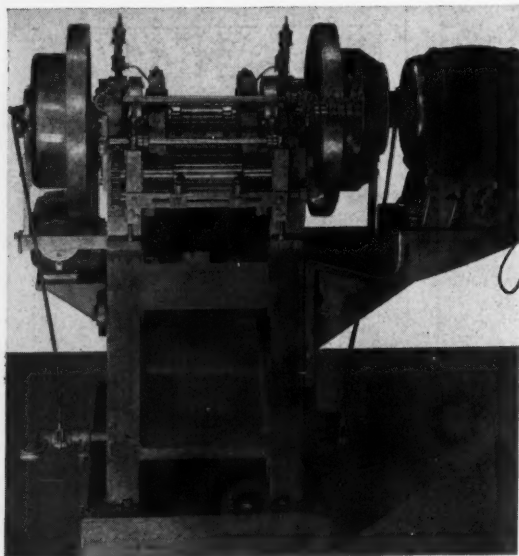
44 Wall Street

New York, N. Y.

continuous feeding of the stock is accomplished through an oscillating die that oscillates at the same rate as the feeder. The speed of the feed rolls is synchronized with the oscillation of the die by turning a hand wheel while the press is in operation.

while the machine is in operation.

The machine is of ball bearing construction throughout and is scientifically lubricated. All parts under strain are made of Manganese Molybdenum steel. Guides are set below the punch level.



Super Speed Punch Press

According to the manufacturer, the design of the press includes neither cams, pawls nor ratchets. Progressive dies without pilots are used and the machine is adapted for either short or long runs and either coil or strip stock. The feed control can be adjusted in five seconds

mild carbon steel, and therefore rendered suitable for equipment where severe cold working is applied during fabrication.

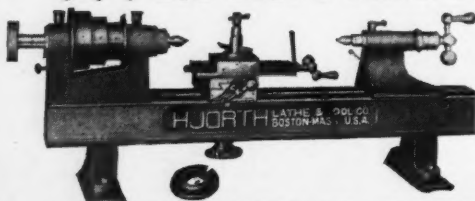
"Chromeweld 4-6" deposits, produced with proper welding procedure and fully annealed at 1550-1600 deg. F., followed

### Lincoln "Chromeweld 4-6" Electrode

Steels known as 4-6 per cent Chromium Steels, which are rapidly gaining acceptance in applications requiring resistance to crude oil corrosion at high temperatures and pressures, can now be successfully welded by use of a new electrode just announced by The Lincoln Electric Company, Dept. E-320, Cleveland, Ohio.

"Chromeweld 4-6" electrode permits full development of the valuable properties of the low-chromium steels. These steels possess a resistance to sulphide corrosion four to ten times that of ordinary steel and a resistance to oxidation at 1000 deg. F. three times as great. The electrode contains the essential element of molybdenum and provides weld metal possessing the necessary high creep strength and other qualities essential for welding the 4-6 per cent chromium steels. Such steels, welded with the electrode can be soft annealed to physical properties similar to those of

### ... for more than 1001 odd jobs



The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeal to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.

## GRANT RIVETERS



● **Pioneers in the riveting field.** Head rivets from smallest to  $\frac{5}{8}$ " diameter, either by noiseless spinning or vibrating hammer method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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96 Silliman Avenue Bridgeport, Conn.

## Why Use A Shaper to cut Keyways when a DAVIS KEYSEATER

will do the job so much quicker and better?

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**DAVIS KEYSEATER CO.**

Exchange & Glasgow Sts.  
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## MONEY- SAVING

## COOLANT PUMPS

## Outstanding Features Offered by RUTHMAN

- Elimination of all packing glands . . .
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- Positive gravity feed . . .
- Protected Ball Bearings . . .
- Low power consumption . . .
- Investigate these and many other money-saving features of "Gusher" Pumps—write for free data sheets.

**GUSHER COOLANT  
PUMP**

**The RUTHMAN MACHINERY Co.**

538 EAST FRONT STREET CINCINNATI, OHIO

by slow cooling in the annealing furnace, or air cooled from 1200 deg., possess approximately the following characteristics: Tensile strength 65,000 to 70,000 lbs. per sq. in.; Yield Point 35,000 to 40,000 lbs. per sq. in.; Ductility of 35 to 40 per cent elongation in 2 in.; Reduction in area 65 to 75 per cent; Hardness (Brinell) 130 to 140. If stress relieved at 1400 deg. F., the physical properties of the "Chromeweld 4-6" deposit are approximately as follows: Tensile strength 80,000 to 90,000 lbs. per sq. in.; Yield Point 55,000 to 65,000 lbs. per sq. in.; Ductility of 24 to 30 per cent elongation in 2 in.; Reduction in area 60 to

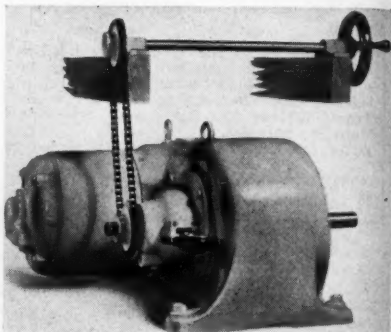
70 per cent; and Hardness (Brinell) 155 to 175.

Applications in which the new electrode now makes available the simplicity and economy of arc welded fabrication include: furnace tubing, cracking stills, hot oil transfer lines, heat exchangers, bubble tower caps, return bends, valves, superheater headers and other similar applications.

"Chromeweld 4-6" is a coated electrode and is made in three sizes:  $\frac{1}{8}$ ,  $\frac{5}{32}$  and  $\frac{3}{16}$  inches.

### Remote Mechanical Control for U. S. Varidrive Motor

A remote mechanical control of variable speed has been developed by U. S.

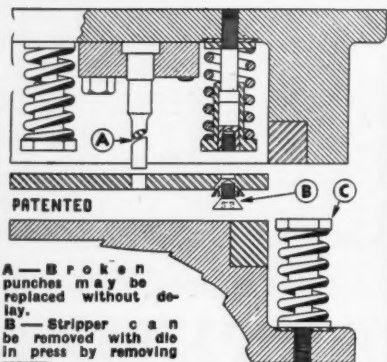


U. S. Varidrive Motor with Remote Mechanical Control

Electrical Motors, Inc., 202 E. Slauson Ave., Los Angeles, Calif., for use with the U. S. Varidrive Motor also made by this firm. The bearing supports, shafts, sprockets and chains have been standardized so that the user can obtain variation of speed on the driven ma-

## STRIPPIT

The most dependable and economical stripping device made.



A—Broken punches may be replaced without delay.

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C—No stripper plate required for stripping scrap—strippits alone will strip it.

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### THE STRIPPIT CORPORATION

1559 Niagara St. Buffalo, N. Y.  
Also Wales Adjustable Hole Punching Dies

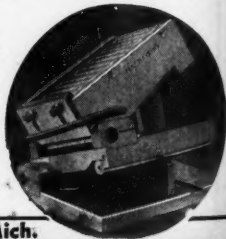
12 ALL POINTS 12  
EAST &  
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## TRAVELING IN GOOD COMPANY

An impressive number of the country's largest corporations and a long list of small, progressive manufacturers are now using the MAGNA-SINE. It is cutting their grinding costs as it will cut YOURS.

### The MAGNA-SINE



The Robbins Engineering Co., 637 Mt. Elliott Ave., Detroit, Mich.

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All types for dressing grinding wheels, Shaped Diamond Tools, etc. Large stock unset stones on hand. Resetting and resharpenings returned same day received.

Send for price list and specify your requirements.

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Established 1852

15 West 44th St., New York, N. Y.

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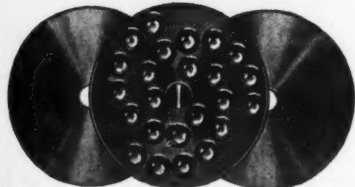
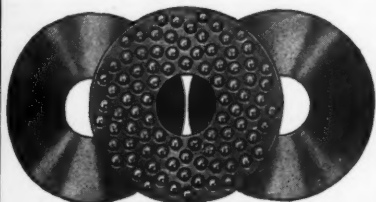


• A much needed tool now at a price that makes it practically indispensable. Full 45 degree range set by easy-to-read scale on interlocking arm. Rigid in all positions and dependable. Also obtainable with 10" sine bar. Slotted face 12"x12", base 9"x12". Weighs 75 lbs. Write for quotation.

**CRESCENT ENGINEERING CO.**

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## BALL THRUST STEP BEARINGS

Special Bearings Made To Order—Any quantity "one bearing or one thousand". Your present bearings duplicated. Send sketch or worn sample, regardless of condition, for quotation.

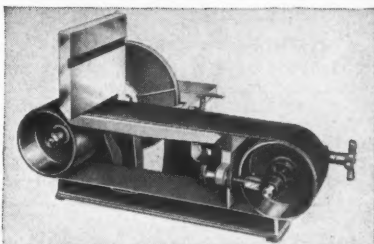
Catalog Upon Request.

**THE GWILLIAM CO.**

358 Furman St.

Brooklyn, N. Y.

## WALKER - TURNER



## 3 TOOLS IN 1

for only \$44.45 complete with 1/2 H. P. Dual Motor 1740 R. P. M.

No. 8M-700 With steel bench complete, \$54.45.

• Carefully engineered . . . compact . . . rugged . . . this new Surfacer combines belt sanding, disc sanding and "stroke" sanding in one handy machine.

For touch-up work on semi-finished or finished products it will pay for itself in no time at all. Rugged enough for continuous operation.

Send for descriptive bulletin or ask your Walker-Turner dealer for a demonstration.

**WALKER-TURNER CO., INC.**

717 Berckman St., Plainfield, New Jersey

*Engineered* **POWER TOOLS**

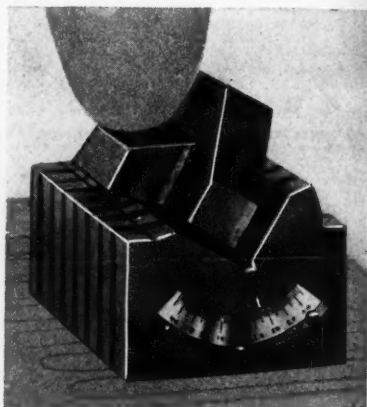
chine conveniently and economically. There is no slippage in the control mechanism; thus the speed control is positive. An infinite variety of speeds within the speed range of the Varidrive may be obtained.

### Karnetic Protractor Block

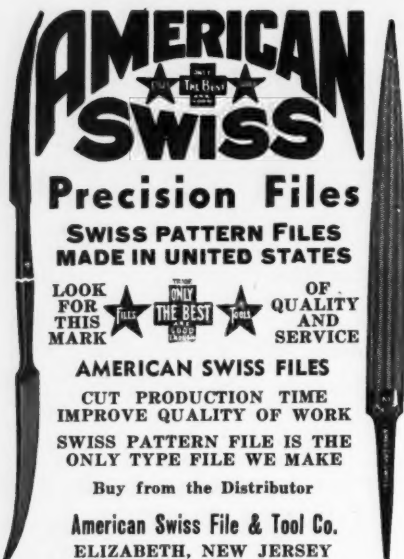
The scope of the highly useful magnetic chuck can now be enlarged by the use of the Karnetic Protractor, illustrated herewith. The Karnetic, product of The Kar Engineering Co., Inc., 220 Hudson St., New York, N. Y., is a block made of alternate laminations of steel and

non-magnetic material which conducts the magnetism from the magnetic chuck to the piece to be ground and holds the piece as firmly as though it rested on the magnetic chuck itself.

In operation, the Kar Protractor becomes a magnet by conduction; it does



Karnetic Protractor Holding Piece of Angular Work



## AMERICAN SWISS

The Best


### Precision Files

**SWISS PATTERN FILES  
MADE IN UNITED STATES**

LOOK  
FOR  
THIS  
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ONLY  
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OF  
QUALITY  
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**AMERICAN SWISS FILES**

CUT PRODUCTION TIME  
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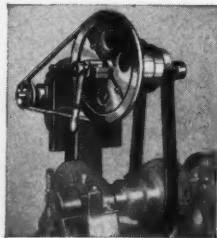
**American Swiss File & Tool Co.**  
ELIZABETH, NEW JERSEY

Also Manufacturers of  
Mechanics' Hand Tools and Knurls

not generate magnetism, and therefore consumes no current. It delivers from 80 to 85 per cent of the holding power of the magnetic chuck with which it is used. The use of the Karnetic permits the making of set-ups of all angles and practically eliminates a large part of the time required in setting up work. It does away with the majority of special fixtures and jigs.

### La Salle Screw Machine Reamers

The LaSalle Screw Machine Reamers, now being made by Machinists Tool Grinding Co., 3038 W. Van Buren St.,



## STEAGE Junior Motor Drives

*Adaptable to Any Cone Pulley Machine!*

Give higher production at lower cost—are simple and easy to operate—pay for themselves in savings. Send for catalog.

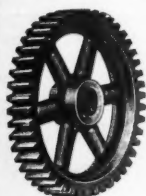
**PRICED FROM \$35.00 UP**

**W. L. STEAGE MACHINERY COMPANY**

21 S. CLINTON ST.



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Immediate Delivery  
Gears, speed reducers,  
sprockets, thrust bear-  
ings, flexible couplings,  
pulleys, etc. A complete  
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any kind. Send us  
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## PRECISION BORING



Easy and Econom-  
ical with  
Flynn Micrometer  
Boring Heads

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**FLYNN MFG. COMPANY**  
437 Bates St., Detroit, Mich.

## HEAVY-DUTY



## BENCH GRINDER



**BALL BEARING. FULLY ENCLOSED 1/3**  
H.P. 3450 R.P.M. Motor (continuous heavy  
duty). 2 wheels 6"x 3/4"—fine and medium.

**PRICE \$22.50**

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**KINGSTON-CONLEY ELECTRIC CO.**  
60 Brook Avenue, Plainfield, New Jersey



For  
Better  
Gaging  
Come  
To

"STANDARD"

## Shockproof Economy

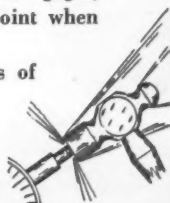
## STANDARD Gears and Pinions used Throughout

By extending the accurate useful life which STAND-  
ARD "Shockproof" dial gages deliver, you naturally  
reduce your gage investment to a mere fraction of  
its previous proportions. In addition to this, the  
gears and pinions used in STANDARD "Shockproof"  
gages are interchangeable with other STANDARD gages,  
thereby extending the economy even to the point when  
repairs are necessary.

Furnished in the above type with graduations of  
.001", .0005", .0001".

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**STANDARD GAGE CO., Poughkeepsie, N. Y.**



Chicago, Ill., have several special and interesting features. The reamers are made with a 7 deg. left hand spiral, standardized shanks, uniform length and ample chip space. The reamers fit all standard floating holders. LaSalle Reamers, made from high speed steel blanks, are carried in stock 90 per cent completed, ready to be ground to any dimension specified.

The reamers can be furnished in fluted type with the lands backed off or relieved, or Rose reamer type with the end cut but not relieved. For those who prefer to order blanks and grind the

reamers to size themselves, hardened blanks, fluted and with shanks ground, can be supplied ready to grind to decimal size.

The illustration shows two styles of



LaSalle Screw Machine Reamers

reamers, the Style A, above, with teeth from  $\frac{3}{4}$  to  $1\frac{1}{4}$  in. long depending upon the size of the reamer, and the Style B, with stub teeth from  $\frac{3}{8}$  to  $\frac{5}{8}$  in. in length depending on the size of reamer.

### Marks Bond

A bonding process, developed to provide protection for metal parts against corrosion and the action of the elements, has been brought out by Bonding Process Corp., 10401 Northlawn Ave., Detroit, Mich. The product, known as "Marks Bond", is said to be fool-proof; that is, considerable latitude is permissible in the different variables. The surface produced is smoothly etched and forms an excellent base for paint or enamel for all products where an even, lustrous finish is required.

The Marks Bond process chemically produces on iron or steel a coating consisting of millions of microscopic crystals which are integral with the metal and have great adherence. Being insoluble in water, this coating effectively stops

**BAUMBACH**

**STANDARDIZED**

**DIE SETS**

SEMI-STEEL      DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, and a listing of more than 95,000 stock sizes, afford a service that is unsurpassed.

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**QUICK-LOADING STOCK REELS**

**SINGLE AND DOUBLE**

For use with automatic machines and punch presses with feeds. Also reels for wire.

**S & S**

**S & S MACHINE WORKS**

4541 W. LAKE STREET . . . CHICAGO, ILLINOIS

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### HIGH SPEED STEEL HAND CUT--ALL SHAPES

SEND FOR ILLUSTRATED 10th Anniversary Catalog—showing multitudes of styles, shapes and cuts.

**THE ROTARY FILE COMPANY**  
STRATFORD CONN.



### Standard GRINDERS

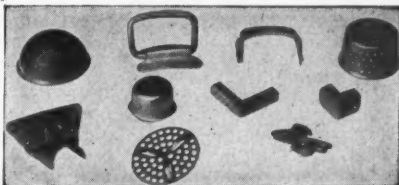
1/4 H. P. 6" wheels to 15  
H. P. 30" wheels.

DISC GRINDERS, 1 H. P.  
to 7 1/2 H. P.  
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Lathes, 1/2 H. P. to 20  
H. P.

VERTICAL ANGLE  
PLATE GRINDERS  
for Planer and Boring Mill,  
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Tool Post and Angle Plate Grinders for Lathes,  
Shaper, etc. 1/4 H. P. to 10 H. P.  
**THE STANDARD ELECTRICAL TOOL CO.**  
8th & Evans Sts. Cincinnati, Ohio

## STAMPINGS



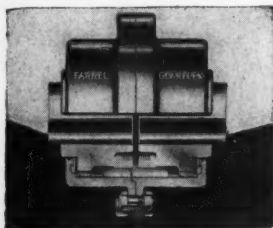
We have been in the job stamping business for over 20 years, and have a well equipped plant with 30 presses ranging from small size up to 30 ton ram pressure.

We are equipped to make our own dies in our modern die shop.

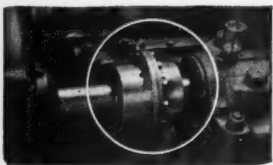
Send sample or blueprints for estimate to Dept. 1.

### WUEST BROS.

930-936 W. Hill Street, Louisville, Ky



Sectional view of Gearflex Coupling showing gear teeth and oil chamber.



A No. 4 1/2 double engagement type Gearflex Coupling on rolling mill drive transmitting 200 H.P. at 680 R.P.M.

## FARREL GEARFLEX COUPLINGS

*give permanent, low cost  
protection against misalignment*

They provide complete flexibility, compensating for parallel and angular misalignment, as well as a combination of the two, and permit free lateral or end float of the connected shafts where such movement is necessary.

There are no parts to wear out or to require adjustment. Operating in oil, dust-proof and moisture-proof, they require no attention except maintenance of the oil at the proper level. Their simplicity, accuracy and rugged construction insure long life and dependable performance.

For complete engineering data, giving ratings, dimensions, weights, list prices, etc., send for a copy of our Bulletin No. 437.

**FARREL-BIRMINGHAM CO., Inc.**  
381 Vulcan St., Buffalo, N. Y.

moisture from penetrating the paint film and provides a grip for the paint that will prevent flicking or peeling. The finishing material flows into the interstices between the fine crystals and securely anchors it to the metal. The solution can be adjusted to temperature or to the time requirements of individual production lines. It is claimed that the Marks Bond process is capable of appreciable savings in processing time, fuel costs, and material costs and tankage space.

The Marks Bond chemical is a concentrated compound which, when dissolved

in water of a certain temperature, forms a solution that reacts immediately on properly cleaned metals. The coating is soft and velvety—opaque and gray in color. Among other features claimed for this process is the practical disappearance of sludge in dip tanks. Ability to work with lower temperatures results in better working conditions for the operators.

Metal is processed either by the dip or spray system methods without additional equipment being necessary. Only 15 to 30 seconds at a temperature of 100 deg. to 180 deg. is required in the spray system or dip tanks, depending on the speed of a production line. The articles to be bonded are usually cleaned chemically.

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**TRADE MARK**  
Alligator Brand Files are available in a complete line of Swiss and American patterns in all sizes, shapes, and cuts to fill every filing need. When you purchase these files, you do so with our guarantee that they have passed the highest tests as to shape, cutting quality and uniform hardness and are perfect in every respect.

Write for catalog and prices.

Specify files bearing the Alligator trade mark.

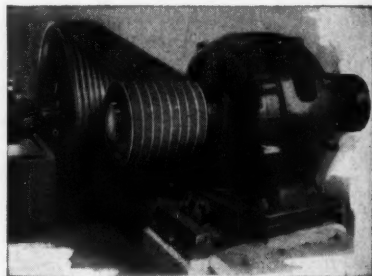
## CARSON-NEWTON CO.

21-23 Prospect St.

Newark, N. J.

## Rockwood V-Belt Drives with Rockwood Pivoted Motor Bases

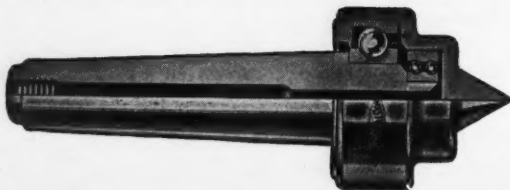
The Rockwood Manufacturing Company, Indianapolis, Ind., is now marketing a complete line of V-belt drives, in-



Rockwood V-Belt Drive with Rockwood Standard Floor Mounting Base

cluding cast iron and steel sheaves and rubber V-belts, and are now bringing out V-belt drives on the Rockwood Piv-

## STURDIMATIC LIVE CENTER for LATHES, GRINDERS and MILLING MACHINES



It turns with the work. Eliminates friction of dead center.

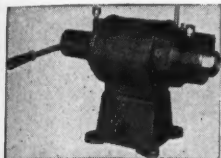
Lowest possible overhang prevents vibration and chatter.

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STURDIMATIC TOOL COMPANY

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## IDEAL SPEED LATHES



**FOR LAPPING  
FINISHING  
POLISHING  
SMALL PARTS**

2 Speed Motor.  
Automatic Brake.  
Collet or 3 Jaw  
Chucks. Hand  
operated or auto-  
matic. Write for  
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**SCHAUER MACHINE CO.**

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**MODEL B2**

To meet the demand for a Demagnetizer that would properly fill the requirements of taking the magnetism out of the work that has become magnetized through induction, we have designed and built two models for large and small work. A single pass over the stationary poles is sufficient to demagnetize the work completely.

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Size:  $7\frac{3}{4}$ " wide, 12" long,  $8\frac{3}{4}$ " high  
Complete with pilot light, switch  
and cord ready for use — operates  
on 110 volt alternating current.

**PRICE**  
**\$65.00**

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Size:  $7\frac{1}{4}$ " wide,  $7\frac{1}{4}$ " long,  $6\frac{3}{4}$ " high  
Complete with switch and cord  
ready for use — operates on 110  
volt alternating current.

**PRICE**  
**\$45.00**

Write for circular.

**L-W CHUCK CO.**

NO. 1-7 N. ST. CLAIR ST. TOLEDO, OHIO

## L-R FLEXIBLE COUPLING

*everlasting*



**PATENTED**

Type IA. A modern  
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**LOVEJOY TOOL WORKS**

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## SHELVING PROTECTS Dies, Tools, Supplies, Etc

Here's your chance to buy sturdy, quality shelving in single units at quantity prices. PARENT shelves keep the house in order—save their cost in protecting expensive tools, supplies, etc.

### UNIT No. 23 (at right)

Size: 36" wide, 12" deep, 7' 3" high. Number of bins  
12—9" w. x 8" h.; 24—9" w. x 10" h. Green enamel  
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Write for catalog showing many other types and sizes.

**PARENT METAL PRODUCTS, INC.**

1703-15 RITTENHOUSE ST.,

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**NOW!**  
**Single Units**  
**At Quantity Prices**

oted Motor Bases. The pivoted motor bases are said to improve V-belt performance as they maintain constant tension in the belts. Any stretch in the V-belt is automatically taken up through the operation of the pivoted motor bases, thus preventing slipping and lowering of efficiency. By maintaining a constant tension, it is impossible for the belt to slip and thus for the surface to become glazed and hard.

The Rockwood Drive is so designed that the tension is removed from the belts when the drive is not running, thus permitting the belt to rest, which

is said to prolong the life of the belt. Although the complete Rockwood Drive with Rockwood V-Belts is marketed by this firm, the bases can be purchased separately to use with existing V-belt drives. It is a simple matter to locate the base in place and attach the motor.

### Wrigraph Drawing Stand

The Wrigraph Drawing Stand shown in the illustration was developed by L. G. Wright, Inc., 5207 Euclid Ave., Cleveland, Ohio, to provide an exceptionally well built adjustable drawing table for making small drawings. It is especially



Tool protected  
by U. S. Patent  
No. 2047147.

## NEW! THE IMPROVED STA-KOOL DIAMOND HOLDER

Patented fin construction permits greater radiation—increases efficiency in the dissipation of heat.

Write for trial offer.

**J. K. SMIT & SONS INC.**  
157 CHAMBERS ST. NEW YORK



Wrigraph Drawing Stand Equipped with Wrigraph Model D-272 Drafting Machine

intended for use in drawing departments where a professional drawing table is needed which can be equipped with a small machine to make the great number of drawings which are smaller than 20x26 inches.

The stand is of oak, securely cross braced, and stained walnut color. The

## THE KOCH TEST INDICATOR

Scientifically designed to give extreme sensitiveness combined with ruggedness. The soft, smooth action of the Koch Test Indicator added to its high magnifying power makes it the choice of master toolmakers, machinists and inspectors. Two live ends—inside and outside to .001". Write for illustrated bulletin and prices.



The only indicator with two live ends.

**THE KOCH TEST INDICATOR** 29 2nd Ave., Nyack, N. Y.



## MAGNETIC CHUCKS

Highest Quality.  
All Sizes—For All  
Types of Work. A  
Complete Line Of  
Rotary, Rectangular  
and Swiveling Mag-  
netic Chucks.

35 Years Experience  
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price list No. 11

**O. S. WALKER CO., INC.**  
WOBURN AVE. WORCESTER, MASS.



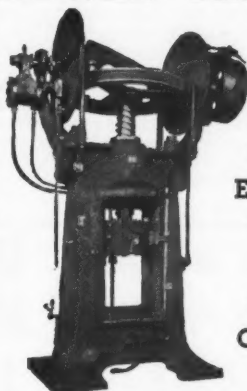
## The CHAMPION EXPANDING MANDREL

Is the only Mandrel which  
completely and accurately  
fills the hole. One  
set of CHAM-  
PION Expanding  
Mandrels—twelve  
of them—will fill  
by thousands  
any inside diame-  
ter from  $\frac{1}{2}$ " to  
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Write for Details!

**THE WESTERN TOOL & MFG. CO.**  
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## PATENT PERCUSSION POWER PRESSES



Excellent  
for  
Coining!  
Embossing!  
Hot and  
Cold  
Pressing  
Of Metals!

Manufactured by

**Zeh & Hahnemann Co.**

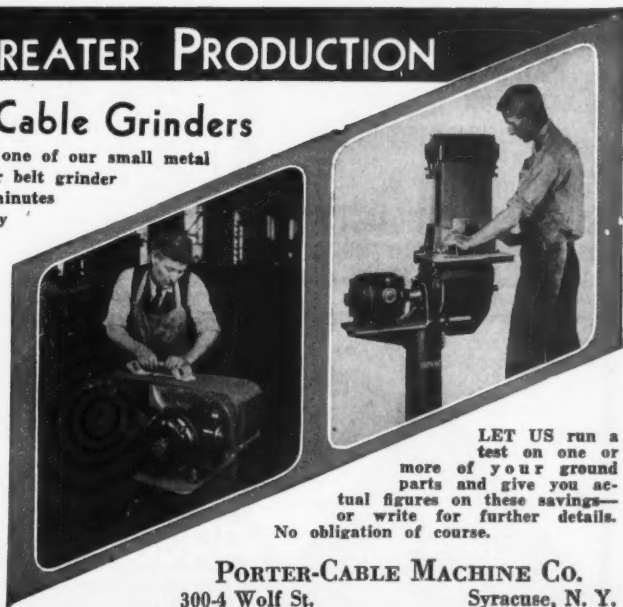
184 Vanderpool St., Newark, N. J.

## 71% GREATER PRODUCTION

### with Porter-Cable Grinders

"The grinding time on one of our small metal parts when put on your belt grinder was reduced from  $1\frac{1}{4}$  minutes to one minute each. Sixty an hour instead of thirty-five, and a better job." Name on request.

Pictures to right show manifold and machine part being ground on 10-inch Type B-3. Porter-Cable Belt Grinders are built in several models, one of which is certain to exactly suit your requirements.



LET US run a  
test on one or  
more of your ground  
parts and give you ac-  
tual figures on these savings—  
or write for further details.  
No obligation of course.

**PORTER-CABLE MACHINE CO.**  
300-4 Wolf St. Syracuse, N. Y.

drawing board tilts 90 deg. and can be clamped at any angle with a unique clamping device which operates from the right side of the table. The height is adjustable from 33 in. to 45 in. Large star wheels clamp the posts securely and absolutely prevent slipping.

The table is so constructed that it can be shipped in a flat carton and the legs can be assembled to the posts in five minutes. The white pine board is 23x31 in. and is treated with shellac to prevent soiling. The table is available equipped with a Model D-272 Wrigraph Drafting Machine if required.

# INTERNAL EXTERNAL BLANCHARD CENTERLESS SURFACE

HARDENED-GROUND-  
PRECISION  
PARTS MADE TO  
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## "Yankee" 2-Speed Hand Drill

The illustration shows the No. 1435 "Yankee" 2-Speed Hand Drill which has been placed on the market by North Bros. Mfg. Co., Dept. MS, Philadelphia, Pa. The drill was designed to handle either delicate jobs with small drills in



"Yankee" 2-Speed Hand Drill

thin metal or projection jobs on average work. The drill is 11 in. long, and provides the advantages of a high speed for fast work and slow speed for easy drilling through at the end of the hole. The shift from one speed to the other can be made with a light touch of the finger.

## "Hammerloid" and "Suede Wrinkle" Finishes

Two new finishes for metal products have been developed by The Glidden Company, Cleveland, Ohio. Hammerloid, illustrated herewith, is a finish that looks like hammered metal and can be used on wood, metal, paper, composition board or molded plastics. It is for interior use only and has excellent adaptation properties. It will air dry dust-free in from two to three hours, and will harden overnight with a full gloss lustre. It can be baked, first allowing the finish to set about an hour, in 45 minutes at 225 deg. F., to a nice semi-gloss lustre. Only one material is needed for both purposes although it cannot be air dried in a flat finish nor baked to produce a gloss finish.

Hammerloid is shipped in compartment cans, the proper amount of bronze pow-

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20 years without  
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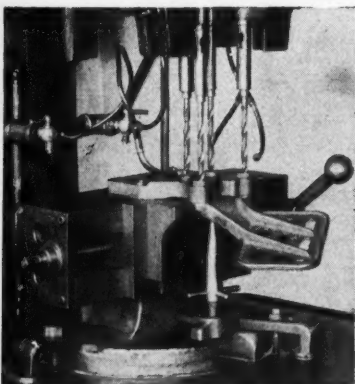


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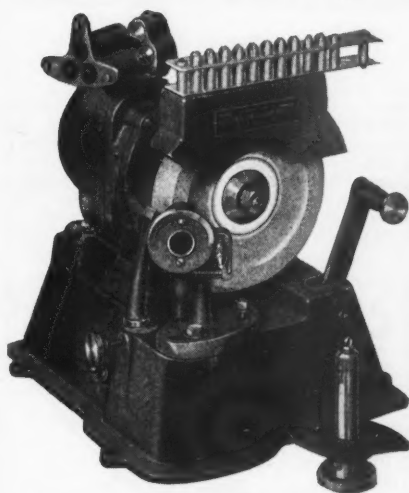
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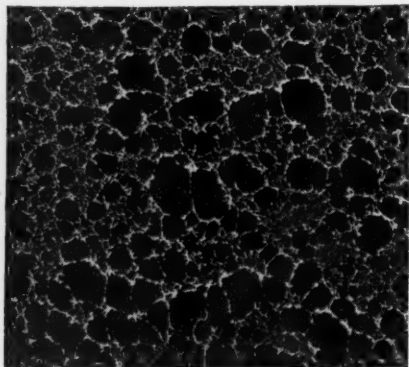
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Hammerloid



Suede Wrinkle Finish

der included for the total gallonage of the container, and as in all paints using bronze powder, only enough should be mixed to use in one day. Hammerloid finish is produced in two spray applications. After proper mixing of the bronze powder and the pigmented liquids, no thinning is required and the article is sprayed with an ordinary gun at nor-

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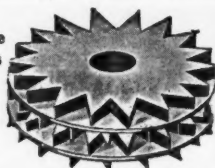
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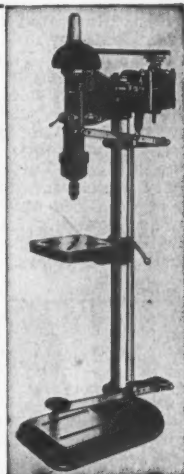
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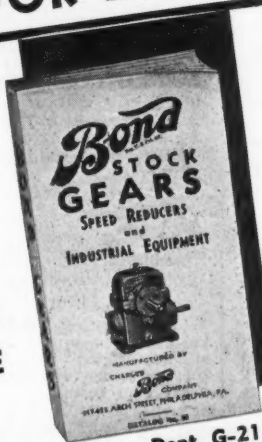
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mered metal appearance.

Also illustrated herewith is The Glidden Company's latest development in wrinkle finish. The finish is an excellent imitation of suede and is further interesting in that it is one of the most fool proof formulas yet developed in this type of finish. The panel illustrated was sprayed with one wet coat and baked one and one-half hours at 275 deg. F. Fifty panels for demonstration purposes were produced and all came out uniform in appearance. Suede Wrinkle finish is available in black and in 12 attractive shades and colors. Suede Wrinkle finish

is particularly adaptable to finishing such metal objects as caskets, adding and addressing machines, instruments, alarm clocks, cash registers, and so on.

### Houghto-Clean, 100 Series

E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., announces an entirely new series of metal cleaners to be known as the Houghto-Clean, 100 Series. This series replaces the earlier series of the same name and covers a wider range of operations.

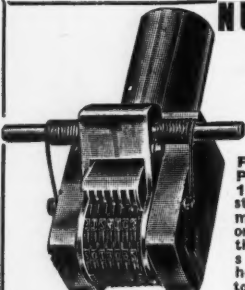
The 100 Series is made up of nine compounds covering light, medium and heavy duty cleaning. The compounds act efficiently and rapidly in any operation where an alkaline cleaner is desired, and will remove all kinds of oils and greases, animal, vegetable and mineral. One grade is especially designed for cleaning after carburizing.

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A folder which describes the individual members of the series and outlines their properties and uses can be had by addressing this firm as above.

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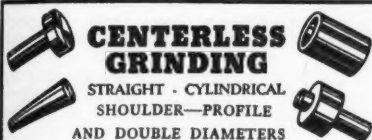


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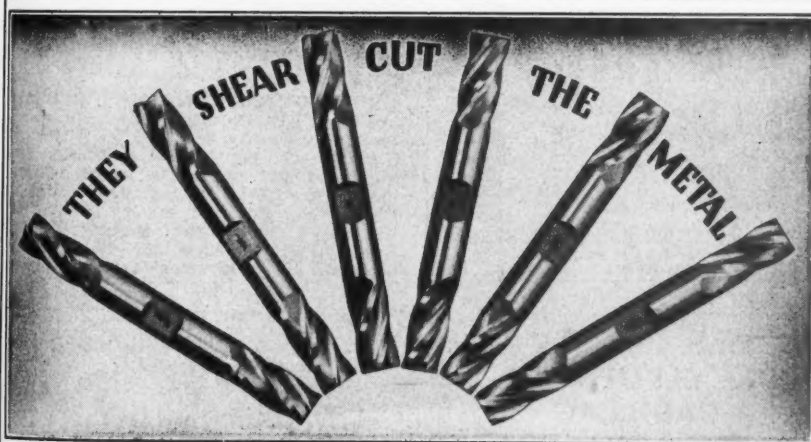
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**FIFTY TURNING, FACING AND BORING OPERATIONS** that can be performed with a set of nine Carboloy lathe tools are described and illustrated in a booklet that is now being issued free by Carboloy Company, Inc., 2975 E. Jefferson Ave., Detroit, Mich. The tools are designed for use on boring bars, and in the usual tool posts of turret lathes, engine lathes and boring mills. The kit is designed for quick and economical production of the every day type of work. Each tool has a wide range of use in its original design, and can be quickly adapted for additional operations by changing shape as required, using a new rapid grinding technic which is described in the free manual that is sent with each kit. The booklet describing these operations will be sent free to any mechanical executive.

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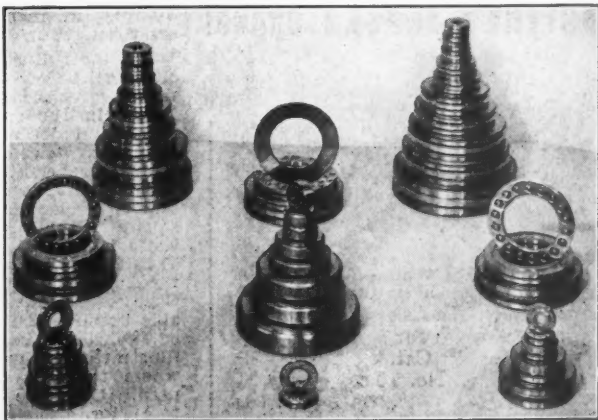


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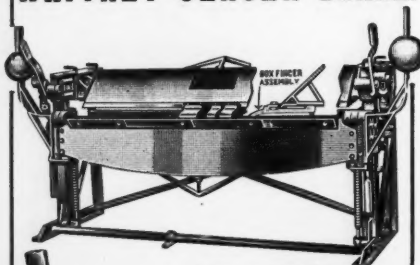
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**BONNEY TOOLS CATALOG No. 37M.** Issued by Bonney Forge & Tool Works, Allentown, Pa., presents a complete new line of tools for industrial purposes. The catalog is made up of 50 loose leaves,  $8\frac{1}{2} \times 10\frac{1}{2}$  in. in size, printed in two colors throughout.

The tools illustrated and described include a line of drop forged carbon steel wrenches with both single and double heads, in the engineers' and "S" type, single and double head thin check nut wrenches, textile type wrenches, set screw wrenches, box wrenches with square and hexagon openings, "T" handle and offset handle socket wrenches with square and hexagon openings. Added to these is the full line of "CV" Chrome-Vanadium steel wrenches which are featured by Bonney. A full line of "CV" Chrome-Vanadium sockets with detachable handles and attachments is included. Various sizes of square drives are illustrated for practically every purpose where tools of this character may be used. Complete sets of wrenches and tools for electrical, ignition and other kinds of work are included as well as a wide range of sockets, attachments, wrenches and tools for servicing electric refrigerators. The line is rounded out by including a complete line of punches, chisels, screw drivers, pliers, Stillson wrenches, miscellaneous tools, "C" clamps, and lathe dogs. Copy free upon request.

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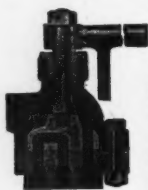
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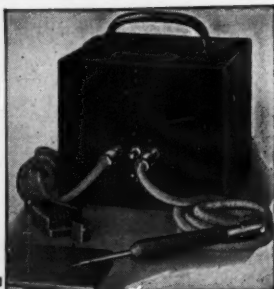
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NORTH BROS. MFG. CO., Dept MS, Philadelphia, Pa., will send a copy of their catalog "Yankee Tools Make Better Mechanics", describing one hundred and one time-saving, work-improving tools, upon request.

COMBUSTION TUBE FURNACES. A four-page folder devoted to combustion tube furnaces is now being issued by Hevi Duty Electric Company, Milwaukee, Wis. The combustion tube type of furnace finds its principal application in carbon determination work, but there are many other uses for which this furnace may be highly efficient, such as standard combustion and special organic analysis. The folder describes and illustrates the furnace and method of operation, and includes specifications. Copy free upon request.

COLONIAL HEAVY DUTY PULLUP BROACHING MACHINE is described in a four-page folder now being issued by Colonial Broach Company, 145 Jos. Campau St., Detroit, Mich. The folder explains the design and construction of this heavy duty broach, which is intended for the broaching of large gears, long holes, spiral gears, for finishing holes from rough castings or forgings, and so on. The operation of the machine whereby the broach is returned to working position without being handled by the operator is explained in detail. Copy free upon request.

PYRO OPTICAL PYROMETER. The measurement of high temperatures by means of a self-contained, accurate, direct reading and dependable optical pyrometer is the subject of this 6-page folder. The folder not only describes and illustrates the "Pyro" Optical Pyrometer, but also explains in detail how the pyrometer is used for the measurement of high temperatures and why such measurement is accurate. Any plant executive who is interested in heat treating equipment and methods can obtain a copy of this folder by addressing The Pyrometer Instrument Company, 101-105 Lafayette St., New York, N. Y.

P & W SCREW MACHINE STUB REAMERS. Pratt & Whitney Stub Reamers designed for automatic screw machine work and for other reaming jobs requiring short tools are described and illustrated in a four-page folder issued by Pratt & Whitney Company, Hartford, Conn. These reamers are carried in stock as standard blanks which

are hardened, fluted, shank ground and with flutes sharpened. Thus the blanks are 90 per cent completed when an order is received and all that is required to fill the order is the grinding and relieving the cutting portion to size. This method makes possible quick delivery. Many users of reamers in quantities purchase these semi-finished blanks, hold them in stock and grind them to size as the need arises.

Copy of the folder free upon request.

**SOUTH BEND 1937 MODEL 9-IN. WORKSHOP PRECISION LATHE CATALOG.**

This 24-page catalog, featuring the 1937 Model 9-In. Workshop Precision Lathe made by this firm, is now being issued by South Bend Lathe Works, South Bend, Ind. The book contains over 150 illustrations showing the features and applications of the lathe.

In addition to the description of the lathe and its parts, a number of pages are devoted to the building of the lathe and illustrations are included showing the methods of obtaining and testing the high degree of accuracy for which the lathe is noted. Included also are a variety of illustrations showing the lathe in use in industrial applications, auto servicing, laboratories, manual training installations, home workshops, and so on.

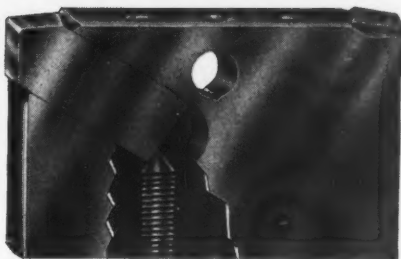
A copy of this catalog can be had by addressing the Technical Service Department of the above company and mentioning this magazine.

**HOW TO INSTRUCT.** Sixteen pages, 5 1/4 x 7 inches

in size. Edited by Glenn Gardiner and Chapin Hoskins. Published by Elliott Service Company, 242 W. 55th St., New York, N. Y. This book comprises a series of practical pointers for department heads, supervisors and foremen on the manner in which workmen should be instructed regarding their tasks. Each one of the four steps—(1) tell him, (2) show him, (3) test him, and (4) check him—is accorded a chapter of elaboration. Other chapters are "What to Teach", "Why Give Reasons Why", "Preparation an Instructor Should Make", "paring the Learner for Instruction", "Making the Right Impression", "What

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to Teach about Safety", "Putting Across Company Policies" and "Imparting Labor Policies". The booklets are intended to sell at ten cents each, with quantities at discount, but sample copies will be sent free to plant managers, general managers, work managers, or other directing heads.

**"HAYNES STELLITE BURNISHING ROLLERS".** A 4-page illustrated folder on Haynes Stellite burnishing rollers is announced by Haynes Stellite Company, a Unit of Union Carbide and Carbon Corporation. The folder describes the advantages of burnishing railroad car axle journals, locomotive driving axle

journals, piston rods, crank pins, etc., with Haynes Stellite rollers. A harder, more wear-resistant and more highly polished surface is obtained by burnishing with rollers of this alloy of cobalt, chromium and tungsten. In addition, these rollers involve a minimum of maintenance expense; a number of Haynes Stellite burnishing rollers have been in constant service for over five years without having incurred any maintenance expense whatever. Copies of the folder can be obtained by writing Haynes Stellite Company, Kokomo, Indiana.

#### **HANDBOOK OF WELDED STEEL TUBING.**

Under this title the Formed Steel Tube Institute has issued a 64-page book which is intended to give the user or prospective user of welded steel tubing a thorough knowledge of the application of this product, its physical, chemical and metallurgical properties, commercial tolerance limitations and extensive engineering data as a guide and aid to both engineers and laymen.

The text begins with a chapter on the manufacture of welded steel tubing after which comes some remarks on the selection of material and instructions regarding the information necessary when ordering welded steel tubing. A page is devoted to the method of checking tolerances on round tubing, followed by tabulations of round tube tolerances on cold rolled steel and hot rolled strip steel.

Following are sections devoted to methods of cutting tube into short lengths, welded tubing for propeller shafts, a table of torque values for automobile propeller shafts, a table of critical speeds of welded tubular propeller shafts, hydraulic testing pressure in pounds for various sizes and gages used in testing the strength of welds, special shapes, flanging, upsets, recommendations for laying out drawings for bent

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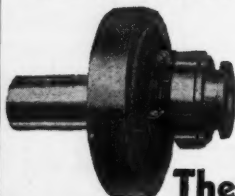
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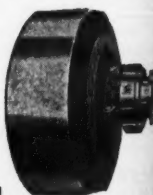
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parts, information on bending, a table of physical properties of welded steel tubing, definition of terms relating to heat treating operations, and a number of other useful tables.

A copy of this book is available to buyers of steel tubing who will address their requests to Steel and Tubes, Inc., 226 E. 131st St., Cleveland, Ohio.

**CJB PILLOW BLOCKS AND BALL BEARINGS.** The entire range of pillow blocks and ball bearings made by the Ahlberg Bearing Co., 321 E. 29th St., Chicago, Ill., is presented in this catalog. The catalog is built up of loose leaves and contains 60 pages of information which should be of use to engineers, designers, and others who are interested in transmission equipment. The book opens with a discussion of new transmission features and methods of applying their modern ball bearings and closes with a description of the facilities available through this firm for the reclamation of ball bearing equipment. Copy free upon request.

**PHOTOTUBE PYROMETER CATALOG.** A recently issued, 16-page catalog, No. 1101B, details the features of the TAG Indicating, Recording and Controlling Pyrometers which utilize a beam of light, a mirror galvanometer and a phototube. This construction offers instantaneous action, accuracy of 0.1% and high sensitivity. Large interior illustrations of the various models are clearly marked and thus provide a quick understanding of the operation.

Copy free upon application to the C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y.

**CHANGES IN STEEL DESIGNATIONS.** Effective immediately, Ludlum Steel Company, Watervliet, N. Y., is changing the grade designations of part of its chrome nickel Silcrome series so that in the future its stainless grades will be designated by numbers indicating as closely as possible their composition.

The following changes have been announced:

Old Designation	New Designation
Silcrome KA2	Silcrome 18-8
Silcrome KA2-S	Silcrome 18-8-S
Silcrome KA2-T	Silcrome 18-8-T
Silcrome KA2-C	Silcrome 18-8-C
Silcrome KA2-MS	Silcrome 18-8-M
Silcrome KA2-EZ	Silcrome 18-8-EZ

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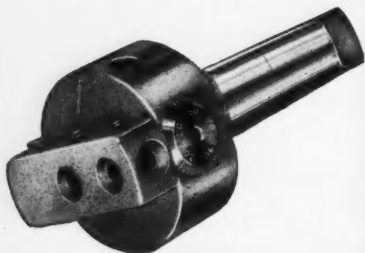
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**BONNEY CATALOG No. 36.** Known as Catalog No. 36, the Bonney Forge and Tool Works, Allentown, Pa., has issued a 56-page book showing a complete line of hand tools for industrial and automotive use. The book illustrates and describes in detail a full line of socket wrenches with handles and attachments in square drives, extra-deep sockets, special sockets, engineers' and tappet wrenches, electrical wrenches, right angle wrenches, S wrenches, miscellaneous special wrenches and special wrenches, screw drivers, punches, chisels, hammers, pliers and other tools. Copy free upon request.

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**RAMSEY SILENT CHAIN DRIVES.** The 36 pages of this book, which is now being issued by Ramsey Chain Company, Inc., Albany, N. Y., contain descriptions, photographs, drawings, specifications, and pictures of illustrations of the silent chains and silent chain drives which comprise the product of this firm. The drives are shown in use on a wide variety of mechanical units and the particular advantages of the drive in each instance are discussed for the benefit of the reader. A chapter is devoted to the design of silent chain drives in which the various factors which are taken into consideration in the design of a silent chain are discussed. Instructions are given for determining the length of the chain and size of sprockets required for a given drive, also for installing, lubricating, and otherwise maintaining the chain in service. Copy free upon request.

**NIAGARA DOUBLE CRANK PRESS BULLETIN No. 64-E.** Manufacturers and users of stampings of the larger size will be interested in this 44-page catalog which describes and illustrates each of the presses included in the line of double crank presses made by Niagara Machine & Tool Works, 649 Northland Ave., Buffalo, N. Y. The presses are described in detail and the advantages of the double crank design are featured. Various sizes and types of double crank presses are shown and illustrations showing the various parts included in the construction of the presses are presented in the text. Tables of specifications are given for each type of press included in the No. 60 Series.

The catalog includes descriptions, illustrations and specifications of Niagara Press Brakes, Gang Punching Presses, and other machines. The Niagara "Air" Clutch is also illustrated and described. Copy free to executives of stamping plants or departments.

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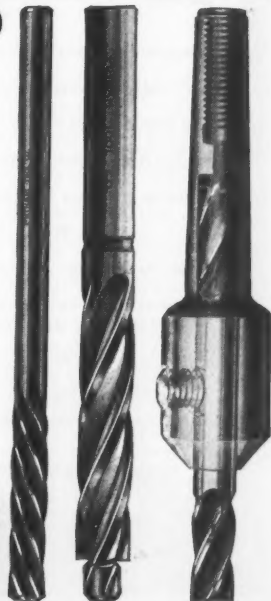
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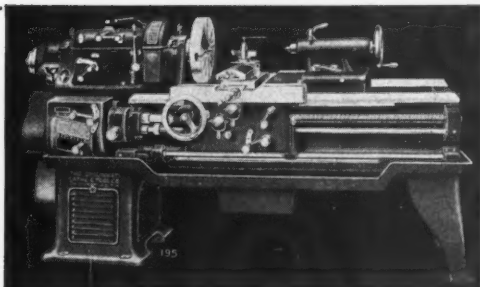
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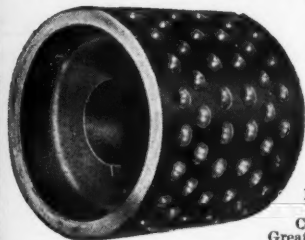
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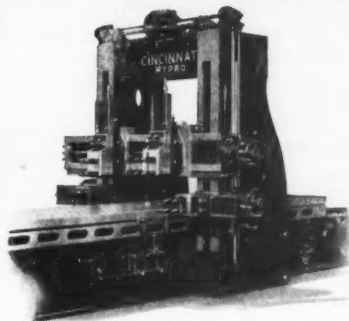
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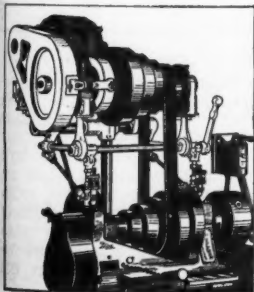
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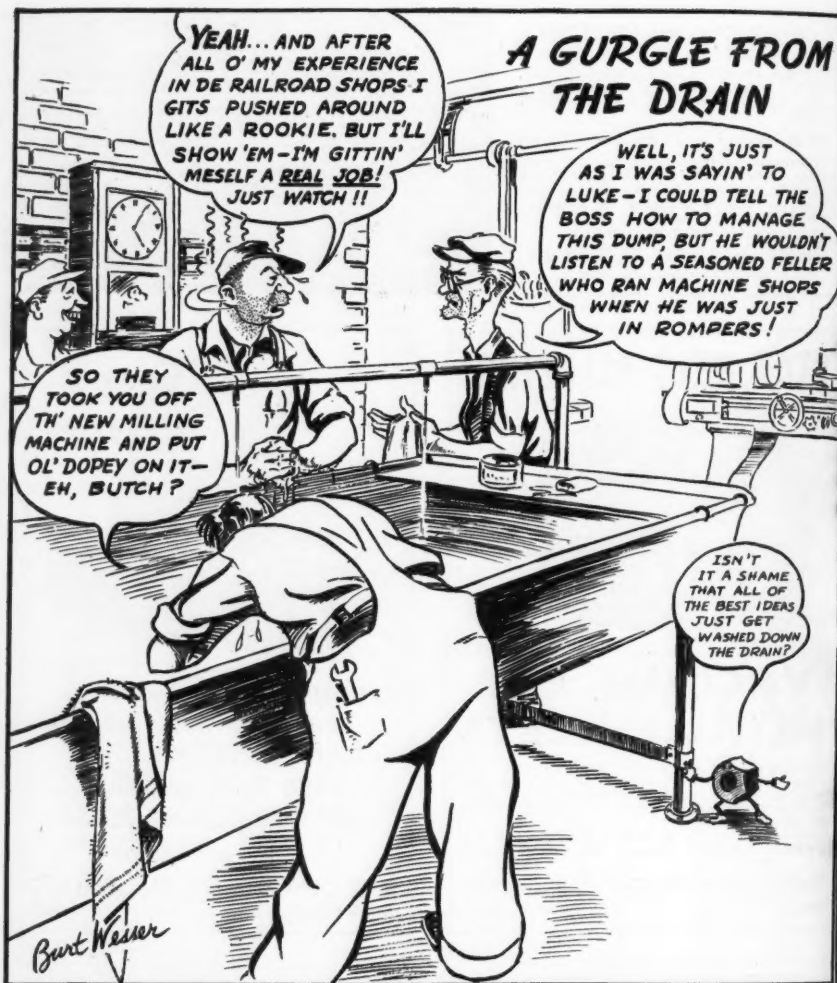
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The text gives complete tables of size and specifications for all of the different

tools, together with prices. A considerable section at the back of the book contains tables of tapers, instructions for drill point grinding, speeds and feeds of drills, decimal equivalents, tap drill sizes, basic thread dimensions, rules on gearing, tables of gear tooth parts, rules and formulas for worm gears, and many other useful tables. A copy of the catalog is available to any mechanical executive who addresses his request on his firm letter head.